Appendix M-1

Fire Protection Plan

DRAFT

Fire Protection Plan

The Trails at Lyons Canyon

JULY 2024

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Table of Contents

SECTION | **PAGE NO.**

APPENDICES

FIGURES

TABLES

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AMSL	Above Mean Sea Level
APN	Assessor's Parcel Number
BTU	British Thermal Unit
CAL FIRE	California Department of Forestry and Fire Protection
CBC	California Building Code
CC&Rs	Covenants, Conditions and Restrictions
CFC	California Fire Code
CFPP	Construction Fire Prevention Plan
FAHJ	Fire Authority Having Jurisdiction
FMZ	Fuel Modification Zone
FPP	Fire Protection Plan
FRAP	Fire and Resource Assessment Program
GIS	Geographic Information Systems
HOA	Homeowner's Association
I-5	Interstate 5
ISO	Insurance Service Office
LACoFD	Los Angeles County Fire Department
MPH	miles per hour
NFPA	National Fire Protection Association
Project	Lyons Canyon Project
SCVWA	Santa Clarita Valley Water Agency
SRA	State Responsibility Area
USGS	United States Geological Survey
VHFHSZ	Very High Fire Hazard Severity Zone
WRCC	Western Regional Climate Center
WUI	Wildland Urban Interface

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Executive Summary

This Fire Protection Plan (FPP) has been prepared for the Trails at Lyons Canyon Project (Project), which proposes the development of 510 dwelling units with a mix of attached and detached dwelling units and affordable senior housing within approximately 41.48 acres, as well as a recreational center, and approximately 176 acres of natural and improved open space within a 233.49-acre property, located in Santa Clarita (City), Los Angeles County, California. The Project is currently zoned as “Heavy Agriculture (A-2)” and “General Commercial (C-3)” and proposes the development of a mix of single-family homes, townhomes and senior units.

The Project site is predominantly vacant with no known on-site structures, but includes fencing, an abandoned water tank, water wells, irrigation lines, Southern California Edison (SCE) electrical distribution lines, and dirt roads from past uses. Regionally, the Project site is located in the northern foothills of the Santa Susana Mountains in the Santa Clarita Valley of unincorporated Los Angeles County (County). Locally, the Project Site is contiguous to The Old Road on the east; west of Interstate 5 (I-5); just south of Sagecrest Circle; and north of Calgrove Boulevard near Ed Davis Park in Towsley Canyon. The proposed development will be situated on multiple parcels, which include Assessor Parcel Numbers (APN’s): 2826-041-039, 2826-023-014, 2826-022-026, 2826-022-027 and 2826-022-035. Primary access to the site is via The Old Road.

The Project site lies within an area considered a Very High Fire Hazard Severity Zone (VHFHSZ), as designated by the Los Angeles County Fire Department (LACoFD) and California Department of Forestry and Fire Protection (CAL FIRE). Fire hazard designations are based on topography, vegetation, and weather, amongst other factors. Structures built within an area designated as a VHFHSZ require the application of Chapter 7A of the California Building Code (CBC), applicable portions of the Los Angeles County Fire Code (Title 32) and provisions for maintained fuel modification zones, amongst others described in the FPP.

The Project site is currently undeveloped, and is vegetated primarily by chaparral, coastal sage scrub and oak woodland, with areas of annual grasslands, alluvial scrub, non-native grassland and riparian scrub. The topography of the Project site is characterized by hillside and valley terrain with moderate to steep slopes. A significant ridgeline is designated in the southern portion of the Project site within the proposed on-site retained open space. The Project area, like all of Southern California and Los Angeles County, is subject to seasonal weather conditions that can heighten the likelihood of fire ignition and spread, and, considering the site’s terrain and vegetation, may result in a fast-moving and intense wildfire.

The FPP evaluates and identifies the potential fire risk associated with the Project’s land uses and identifies requirements for water supply, fuel modification and defensible space, access, building ignition and fire resistance, and fire protection systems, among other pertinent fire protection criteria. The purpose of this FPP is to generate and memorialize the fire safety requirements and standards of the LACoFD along with Project-specific measures based on the Project site, its intended use, and its fire environment.

Fire service would be provided by the LACoFD. Per Section 4.1.1, the Project population and number of calculated emergency calls were evaluated for their potential to impact LACoFD’s response capabilities from its nearest existing stations. The addition of fewer than 142 calls per year to Station 124's 2,296[1] call volume would not increase demand for service beyond the capacity of existing LACoFD facilities.

As determined during the analysis of the site and its fire environment, the Project site, in its current condition, may include characteristics that, under favorable weather conditions, could have the potential to facilitate fire spread. Under extreme conditions, wind-driven wildfires from the east/south/southeast/west are likely to cast embers onto the property. Once the Project community is built, the on-site fire potential will be lower than its current condition due to fire safety requirements that will be implemented on-site. The proposed residential structures would be built using ignition-resistant materials pursuant to the most recent County Fire and Building Codes (Chapter 7-A – focusing on structure ignition resistance from flame impingement and flying embers in areas designated as high fire hazard areas), which are the amended 2019 California Fire Code and 2019 California Building Code. This would be complemented by a combination of the following required and Project-specific fire protection features:

- Ignition resistant landscapes,
- Perimeter fuel modification zone,
- Improved water availability, capacity, and delivery system,
- Project area firefighting resources,
- Fire department access throughout the developed areas,
- Monitored defensible space/fuel modification,
- Interior, automatic fire sprinkler systems in all structures,
- Monitored interior sprinklers in applicable structures,
- Fire response travel times based on County response guidelines, and
- Other components that would provide properly equipped and maintained structures with a high level of fire ignition resistance.

Post-wildfire save and loss assessments have revealed specifics of how structures and landscapes can be constructed and maintained to minimize their vulnerability to wildfire. Among the findings were: how construction materials and methods protect homes, how fire and embers contributed to ignition of structures, what effects fuel modification had on structure ignition, the benefits of fast firefighter response, and how much (and how reliable) water was available, were critically important to structure survivability. Following these findings over the last 20 years and continuing on an ongoing basis, the Fire and Building codes have been revised, accordingly. Los Angeles County now contains some of the most restrictive codes for building within Wildland Urban Interface (WUI) areas that focus on preventing structure ignition from heat, flame, and burning embers.

Fire risk analysis conducted for the Project resulted in the determination that wildfire has occurred and will likely occur near the Project area again, but the Project would provide ignition-resistant landscapes (drought-tolerant and low-fuel-volume plants) and ignition-resistant structures, and defensible space with the implementation of specified fire safety measures. LACoFD will be responsible for annual inspections and enforcement of offsite FMZ. Further, based on site-specific findings and as part of the FPP's conservative approach, although not required by LACoFD, alternative materials and methods (e.g., 6-foot fire wall) will be incorporated into areas where less than100-feet can be accommodate onsite, specifically on the eastern boundary of the Project's southwest corner. The 200-foot-wide FMZ, when properly maintained, will effectively minimize the potential for structure ignition from direct flame impingement or radiant heat within the Project site. The onsite FMZ for the Project would be maintained in perpetuity by a funded Homeowner's Association (HOA), or similarly funded entity. The offsite brush clearance for

[1] LACoFD 2021

areas where the full 200-foot FMZ cannot be achieved onsite would be the responsibility of the neighboring property owner, and inspected and enforced by the LACoFD.

This FPP provides a detailed analysis of the Project, the potential risk from wildfire, and potential impacts on the LACoFD, as well as analysis on meeting or exceeding the requirements of Los Angeles County. Further, this FPP provides requirements, recommendations, and measures to reduce the risk and potential impacts to acceptable levels, as determined by the LACoFD.

1 Introduction

The Fire Protection Plan (FPP) has been prepared for the proposed Lyons Canyon Project (Project) in unincorporated Los Angeles County, California. The purpose of the FPP is to evaluate the potential impacts resulting from wildland fire hazards and identify the measures necessary to adequately mitigate those risks to a level consistent with County of Los Angeles (County) standards. Additionally, this FPP establishes and memorialize the fire safety requirements of the Fire Authority Having Jurisdiction (FAHJ), which is the Los Angeles County Fire Department (LACoFD). Requirements and recommendations detailed in the FPP are based on Project site-specific characteristics, applicable code requirements, and input from the Project's applicant, planners, engineers, and architects, as well as the FAHJ.

As part of the assessment, the FPP has considered the fire risk presented by the Project site including the property location and its topography, geology, surrounding combustible vegetation (fuel types), climatic conditions, fire history, and the proposed land use. The FPP addresses water supply, access, structural ignitability, and ignition resistive building features, fire protection systems, and equipment, impacts to existing emergency services, defensible space, and vegetation management. The FPP also identifies fuel modification zones and recommends the types and methods of treatment that, when implemented and maintained, are designed to protect the Project's assets. The FPP also recommends measures that developer/builders, property owners, and the Homeowner's Association (HOA) will take to reduce the probability of structural and vegetation ignition.

The Project is located within the boundaries of the LACoFD and thus the FPP addresses LACoFD's response capabilities and response travel time within the Project area, along with projected funding for facility improvements and fire service maintenance.

The following tasks were performed toward completion of this FPP:

- Gather site-specific climate, terrain, and fuel data;
- Collect site photographs[2];
- Process and analyze the data using the latest geographic information system (GIS) technology;
- Predict fire behavior using scientifically based fire behavior models, comparisons with actual wildfires in similar terrain and fuels, and experienced judgment;
- Analyze and guide the design of proposed infrastructure;
- Analyze the existing emergency response capabilities;
- Assess the risk associated with the Project site;
- Evaluate nearby firefighting and emergency medical response resources; and
- Prepare the FPP detailing how fire risk will be mitigated through a system of fuel modification, structural ignition resistance enhancements, and fire protection delivery system upgrades.

[2] Field observations were used to augment existing digital site data in generating the fire behavior models and formulating the recommendations presented in the FPP. Refer to Appendix A, Representative Site Photographs, for site photographs of existing site conditions.

1.1 Project Summary

1.1.1 Location

Regionally, the Project site is located in the northern foothills of the Santa Susana Mountains in the Santa Clarita Valley of unincorporated Los Angeles County (County). Locally, the Project site is contiguous to The Old Road on the east; west of Interstate 5 (I-5); just south of Sagecrest Circle; and north of Calgrove Boulevard near Ed Davis Park in Towsley Canyon. The Project is located in U.S. Geological Survey's 7.5 Minute Oat Mountain, California quadrangle, within Township 3N, Range 16W, and includes portions of Sections 04 and 09. The 233.49-acre Project site is within Los Angeles County's Santa Clarita Valley Plan Area. The Project will be situated on multiple parcels comprised of the following Assessor Parcel Numbers (APN's): 2826-041-039, 2826-023-014, 2826-022-026, 2826-022-027 and 2826-022-035 (Figure 1. Project Location). Primary access to the site is via The Old Road.

Regional access to the Project site would be via I-5 with on- and off-ramps in both directions located at Calgrove Boulevard proximate to the southwest corner of the Project site. Calgrove Boulevard intersects with The Old Road, which parallels I-5 as a frontage road adjacent to the Project site on the east. Regional access to the Project site is also provided in both directions via the Pico Canyon/Lyons Avenue on- and off-ramps located north of the Project site. Local access to the Project site would be provided by two primary access points off The Old Road.

The entirety of the proposed property lies within the state responsibility area (SRA) VHFHSZ, as statutorily designated by CAL FIRE (2007) and the LACoFD (Figure 2, Fire Hazard Severity Zone Map).

1.1.2 Project Description

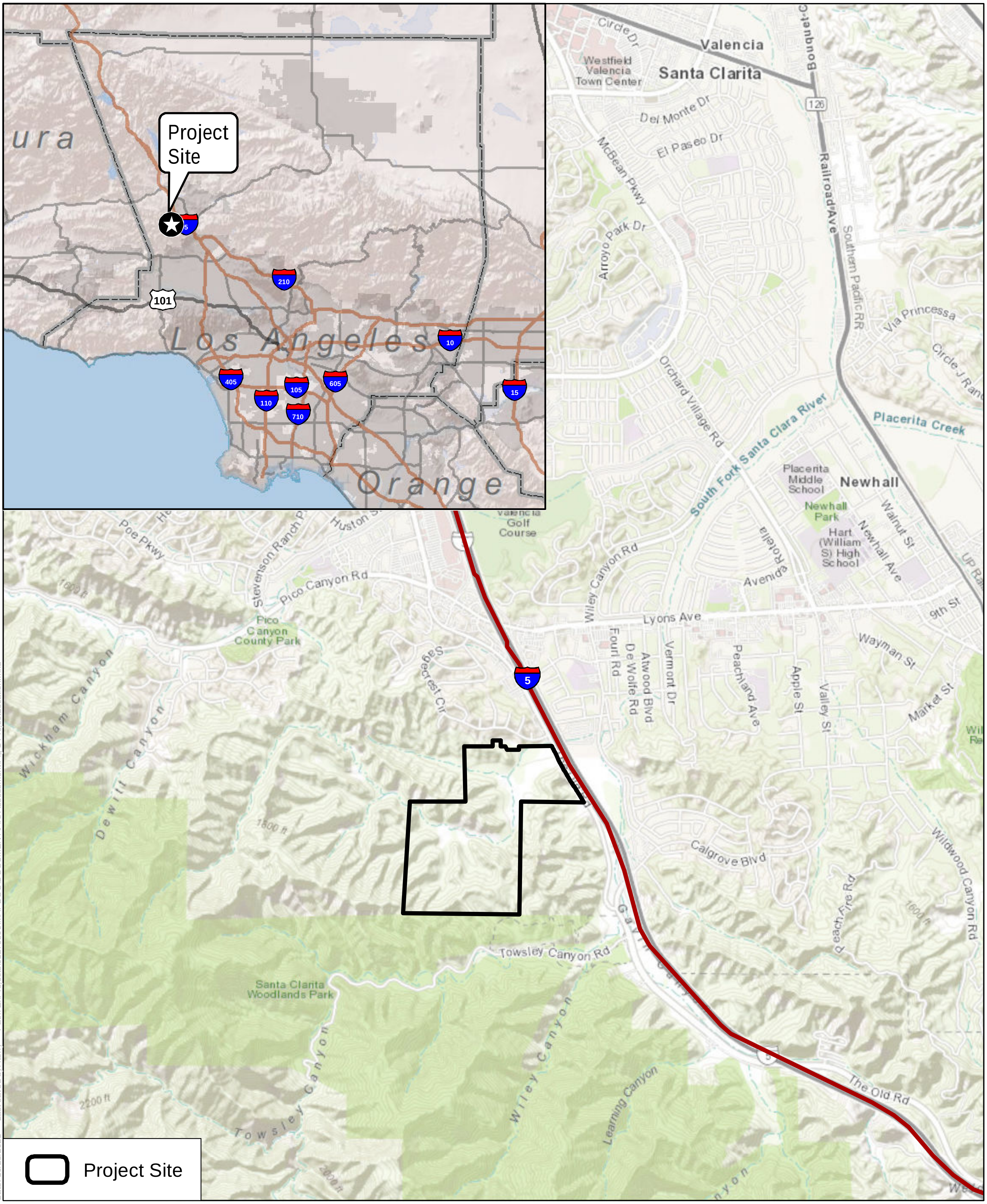
The Lyons Canyon Project would include the development of 510 dwelling units with a mix of attached and detached dwelling units and affordable senior housing within approximately 41.48 acres, as well as a recreational center and approximately 176 acres of natural and improved open space. Project infrastructure would include internal roadways, trails and a new trailhead, a new water tank, and three Los Angeles County Flood Control District (LACFCD) lots with debris and desilting basins.

Off-site improvements of the Project include development of an 8-foot-wide sidewalk along The Old Road fronting the Project site to provide pedestrian access into the site, and widening The Old Road along the Project site frontage to include a total of 80-foot right of way, including sidewalk, curb, and gutter. Between the proposed sidewalk and the portion of the Project site's eastern boundary (adjacent to The Old Road), the Project proposes a retaining wall of a maximum of 4 feet in height. In addition to improvements to The Old Road, the Project includes off-site utility infrastructure components, including utility water line, booster station, and water tank infrastructure improvements.

1.1.3 Current Land Use

The Project Site is predominantly vacant with no known on-site structures, but includes fencing, an abandoned water tank, water wells, irrigation lines, Southern California Edison (SCE) electrical distribution lines, and dirt roads from past uses. The topography of the Project site is characterized by hillside and valley terrain with moderate to steep slopes. A significant ridgeline is designated in the southern portion of the Project site within the proposed on-site retained open space. Elevations in the Project site range from approximately 1,654 feet above mean sea level (amsl) at the southwest corner to approximately 1,300 feet amsl at the northeast corner. Lyons Canyon, located in the central portion of the Project site, drains eastward into the South Fork of the Santa Clara River, which flows to the Santa Clara River approximately 3.75 miles northeast of the Project site. The Project site is primarily vegetated by ruderal/disturbed land, chaparral, coastal sage scrub and oak woodland, with areas of annual grasslands, alluvial scrub, non-native grassland and riparian scrub.

The area surrounding the Project site includes residential uses and limited commercial uses on Sagecrest Circle and the Stevenson Ranch residential community to the north; Ed Davis Park in Towsley Canyon and the City of Santa Clarita's Riverdale Park and Open Space to the south; The Old Road and I-5 to the east; and vacant land and open space to the west.



SOURCE: USGS 7.5 Minute Series, Oat Mountain Quadrangle; Township 3 North, Range 16 West, Sections 4 & 9

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0 1,500 3,000 Feet

FIGURE 1

Project Location

Fire Protection Plan for the Trails at Lyons Canyon Project

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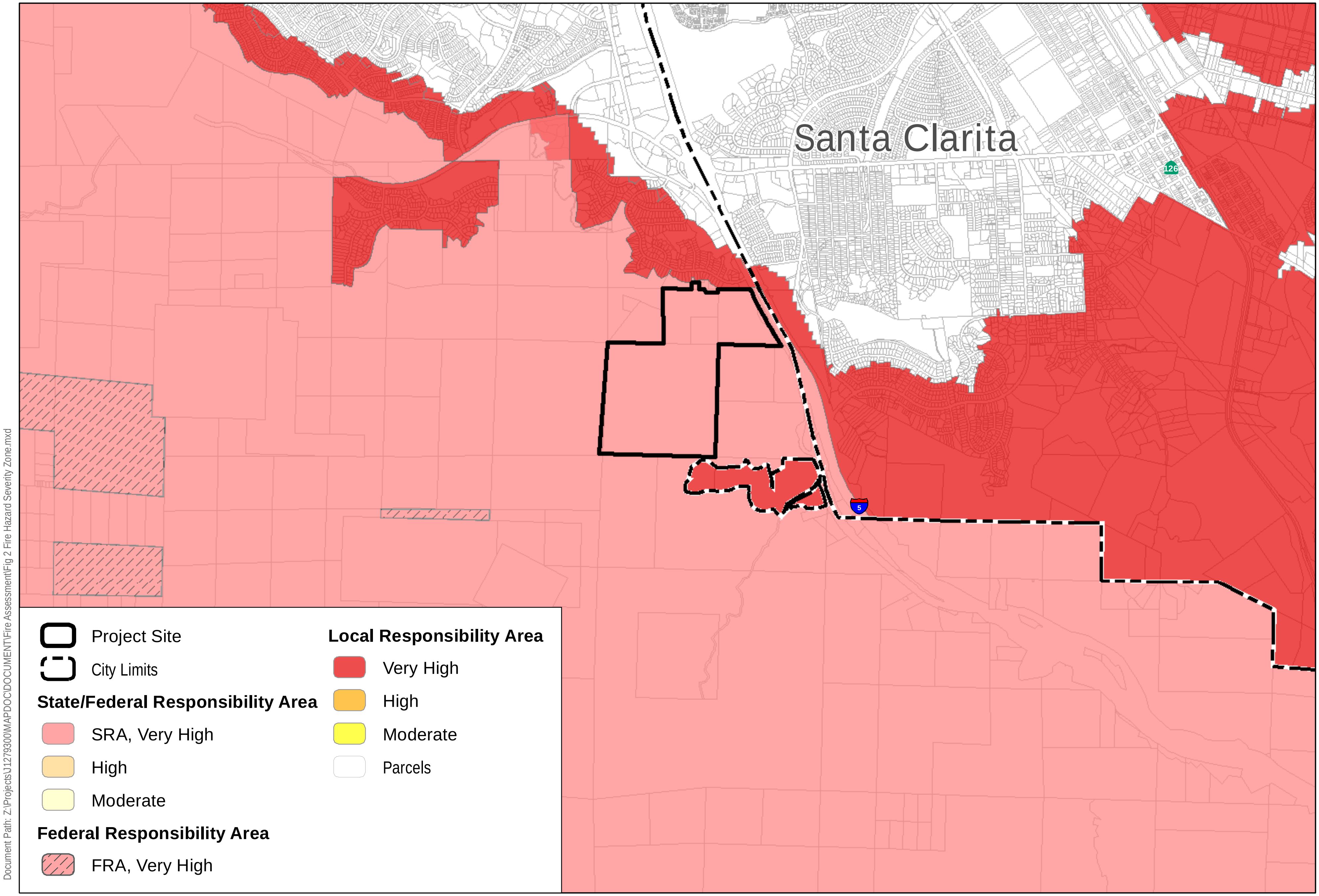

SOURCE: PARCELS-LOS ANGELES COUNTY GIS; FIRE DATA- LOS ANGELES COUNTY GIS

DUDEK

0 1,500 3,000 Feet

FIGURE 2

Fire Hazard Severity Zones Map

Fire Protection Plan for the Trails at Lyons Canyon Project

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SOURCE: UNITED CIVIL INC. 2023

DUDEK

FIGURE 3

Site Plan

Fire Protection Plan for the Trails at Lyons Canyon Projec

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1.2 Applicable Codes and Existing Regulations

The FPP demonstrates that the Project would comply with applicable portions of Title 32 of the Los Angeles County Code, as amended, and adopted by reference the 2019 edition of the California Fire Code (CFC) (or current edition at the time of Project approval). Title 32 is hereafter referred to as the 2020 County of Los Angeles Fire Code or "Fire Code". The Project also complies with Chapter 7A of the 2019 California Building Code (CBC); the 2019 California Residential Code, Section 237; and the 2018 Edition of the International Fire Code as adopted by the County. The Project would also be subject to the provisions of section 4291 of the Public Resources Code regarding brush clearance standards around structures and the Los Angeles County Fire Department guidelines for Fuel Modification Plans.

Chapter 7A of the CBC addresses structural ignition resistance and reducing ember penetration into homes, a leading cause of structure loss from wildfires (California Building Standards Commission 2019). Thus, code compliance is an important component of the requirements of the FPP, given the Project's wildland-urban interface (WUI) location that is within an area statutorily designated as a Very High Fire Hazard Severity Zone (VHFHSZ) within a State Responsibility Zone (SRA) by the California Department of Forestry and Fire Protection (CAL FIRE) (FRAP 2007). Fire hazard designations are based on topography, vegetation, and weather, among other factors with more hazardous sites, including steep terrain, unmaintained fuels/vegetation, and WUI locations. Projects situated in VHFHSZ require fire hazard analysis and the application of fire protection measures to create ignition-resistant structures and defensible communities within these WUI locations, as required by LACoFD's Fire Code Section 4908.1- Fuel Modification Plan in Fire Hazard Severity Zones. VHFHSZ designations do not, in and of themselves, indicate that it is unsafe to build in these areas. As described in the FPP, the Project would meet applicable code requirements for building in these higher fire hazard areas. These codes have been developed through decades of wildfire structure save and loss evaluations to determine the causes of building losses and saves during wildfires. The resulting fire codes now focus on mitigating former structural vulnerabilities through construction techniques and materials so that the buildings are resistant to ignitions from direct flames, heat, and embers, as indicated in the 2019 California Building Code (Chapter 7-A, Section 701A Scope, Purpose, and Application) (California Building Standards Commission 2019). The following are portions of the LA County Fire Code and LA County Building Code that the Project shall implement to ensure compliance.

Fire Apparatus Access

Section 503.2.1, Dimensions. Fire apparatus access roads shall have an unobstructed width of not less than 20 feet (6,096 mm), exclusive of shoulders, except as specified in Sections 503.2.1.1 through 503.2.1.2.2.2, and for approved security gates in accordance with Section 503.6. Fire apparatus access roads shall have an unobstructed vertical clearance clear to the sky.

Exception: A minimum vertical clearance of 13 feet 6 inches (4,114.8 mm) may be allowed for protected tree species adjacent to access roads. Any applicable tree-trimming permit from the appropriate agency is required.

503.2.1.2 Commercial, industrial, and multi-family residential developments. Fire apparatus access roads for commercial, industrial, and multifamily-residential developments shall be installed and arranged in accordance with Sections 503.2.1.2.1 through 503.2.1.2.2.2. For purposes of this section, the highest roof surface shall be determined by measurement of the vertical distance between the access roadway and the eave of a pitched roof, the intersection of the roof to the exterior wall, or the top of parapet walls, whichever is greater. 503.2.1.2.1 Where the highest roof surface does not exceed 30 feet. For buildings where the vertical distance between the access roadway and the highest roof surface does not exceed 30 feet (9144 mm), fire apparatus access roads shall have an unobstructed width of not less than 26 feet (7925 mm), exclusive of shoulders, and an unobstructed clearance of clear to the sky.

Exception: The 26-foot (7,925 mm) width may be reduced to not less than 20 feet (6,096 mm), when approved by the fire code official. This exception shall not be applied for a distance of 25 feet (7,620 mm) on either side of a hydrant.

Section 503.2.1.2.2, Where the highest roof surface exceeds 30 feet. For buildings where the vertical distance between the access roadway and the highest roof surface exceeds 30 feet (9,144 mm), an approved fire apparatus access roadway with a minimum width of 28 feet (8,535 mm), exclusive of shoulders shall be provided in the immediate vicinity of the building or portion thereof. This roadway shall have an unobstructed clearance of clear to the sky.

Exception: The 28-foot (8,535 mm) width may be reduced to not less than 20 feet (6,096 mm), when approved by the fire code official. This exception shall not be applied for a distance of 25 feet (7,620 mm) on either side of a hydrant.

Section 503.2.1.2.2.1, Proximity to building. At least one required access route meeting this condition shall be located such that the edge of the fire apparatus access roadway, not including shoulders, that is closest to the building being served, is between 10 feet (254 mm) and 30 feet (9,144 mm) from the building, as determined by the fire code official, and shall be positioned parallel to one entire side of the building. The side of the building on which the fire apparatus access road is positioned shall be approved by the fire code official.

Section 503.2.3, Surface. Construct an approved fire apparatus access road that is designed and maintained with an asphalt, concrete, or other approved driving surface capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds (34,050 kg).

Section 503.2.4, Turning radius. The minimum turning radius shall be not less than 32 feet (9,754 mm) measured at the centerline of the required access roadway.

Section 503.2.5, Dead-ends. Dead-end fire apparatus access roads in excess of 150 feet (45,720 mm) shall be provided with an approved turnaround. The turnaround shall be oriented on the access roadway in the proper direction of travel.

Section 503.2.7, Grade. Fire apparatus access roads shall not exceed 15 percent in grade.

Section 503.3, Marking and Signage. Where required by the fire code official, approved signs or other approved notices or markings that include the words NO PARKING—FIRE LANE shall be provided for fire apparatus access roads to identify such roads, to clearly indicate the access to such roads, or to prohibit the obstruction thereof. The means by which fire lanes are designated shall be maintained in a clean and legible condition at all times and be replaced or repaired when necessary to provide adequate visibility. A no-parking designation shall meet the requirements of California Vehicle Code Section 22500.1 and be approved by the fire code official.

Signs shall have a minimum dimension of 12 inches (305 mm) wide by 18 inches (457 mm) high and have red letters on a white reflective background. Signs shall be posted on one or both sides of the fire apparatus road as required.

Section 503.6, Gates. The installation of security gates across a fire apparatus access road shall be approved by the fire code official. Where security gates are installed, they shall have an approved means of emergency operation.

Gates securing the fire apparatus access roads shall comply with all of the following criteria:

1. Where a single gate is provided, the gate width shall not be less than 20 feet (6,096 mm), except on a fire apparatus access roadway approved to be a lesser width, in which case the gate shall not restrict that width. Where a fire apparatus road consists of a divided roadway, the gate width shall be not less than 15 feet (4,572 mm) for residential use and 20 feet (6,096 mm) for commercial/industrial uses.
2. Gates shall be of the swinging or sliding type.
3. Construction of gates shall be of materials that allow manual operation by one person.
4. Gate components shall be maintained in an operative condition at all times and replaced or repaired when defective.
5. Electric gates shall be equipped with a means of opening the gate by fire department personnel for emergency access. Emergency opening devices shall be approved by the fire code official.
6. Methods of locking shall be submitted for approval by the fire code official.
7. Electric gate operators, where provided, shall be listed in accordance with UL 325.8. Gates intended for automatic operation shall be designed, constructed, and installed to comply with the requirements of ASTM F2200.

Ignition Resistant Construction

Within the limits established by law, construction methods intended to mitigate wildfire exposure will comply with the wildfire protection building construction requirements contained in the Los Angeles County Building Code including the following:

1. Los Angeles County Building Code, Chapter 7A
2. Los Angeles County Residential Code, Section R327
3. Los Angeles County Referenced Standards Code, Chapter 12-7A

Construction practices respond to the requirements of the LACoFD Fire Code Title 32 and the Los Angeles County Building Code (Title 26, Chapter 7A), “Construction Methods for Exterior Wildfire Exposure” These requirements include the ignition resistant requirements found in Chapter 12-7A of the Los Angeles County Referenced Standards Code. While these standards will provide a high level of protection to structures in this development and should reduce or eliminate the need to order evacuations, there is no guarantee of assurance that compliance with these standards will prevent damage or destruction of structures by fire in all cases.

Infrastructure and Fire Protection Systems

Section 20.16.060 - Minimum fire flow and fire hydrant requirements.

A. minimum fire flow and fire hydrant requirements shall be determined by the fire chief or fire marshal. The computation of the available fire flow shall be based upon a minimum of 20 pounds per square inch (psi). residual operating pressure remaining in the street main from which the fire flow is being measured at the time of measurement of the fire flow. The fire chief or fire marshal shall be guided by but may adjust the quantities set forth in the fire department's regulations on the basis of local conditions, exposure, congestion and construction of buildings. Should the fire chief or fire marshal determine that it is necessary to require a fire flow pursuant to this section in excess of 5,000 gallons per minute, that determination must first be approved by the water appeals board. The fire department and water purveyors shall cooperate to establish improved duration requirements to increase the water available for wildfires in very high fire hazard severity zones.

Also:

1. Very High Fire Hazard Severity Zones and Mountainous Areas Involving Slopes of Eight Percent Grade or Greater. When developments occur in such areas, the fire flow duration should be provided from storage located at an elevation capable of delivering the fire flow by gravity. Pumping stations in gravity feed systems shall have available two separate means of pumping; one such means may be either a portable emergency generator or portable pumping unit driven by an internal combustion engine. An alternative system employing dual pumping facilities utilizing two independent sources of power, one of which shall be an internal combustion engine utilizing natural gas piped to the site or other fuel stored on the site, may be substituted for a gravity system.

The fire flow shall be in compliance with Appendix B in the 2020 County of Los Angeles Fire Code. The fire flow requirement is 2500 GPM @ 20 PSI for 2 hours.

20.16.140 - Fire hydrants—Size, type and location.

The fire hydrant requirements shall be incompliance with Appendix C in the 2020 County of Los Angeles Fire Code.

Defensible Space and Vegetation Management

An important component of a fire protection system is the provision for fire-resistant landscapes and modified vegetation buffers. An FMZ is a strip of land where combustible vegetation has been removed and/or modified and partially or completely replaced with more adequately spaced, drought-tolerant, fire-resistant plants in order to provide a reasonable level of protection to structures from wildland fire. FMZs are designed to provide vegetation buffers that gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones, restricted vegetation zones, and irrigated zones adjacent to each other on the perimeter of the WUI exposed structures.

Los Angeles County Fire Code (Title 32, Fire, Section 4908) is more restrictive than the 2019 California Fire Code (Section 4907 — Defensible Space), Government Code 51175 – 51189, and Public Resources Code 4291, which require that fuel modification zones be provided around every building that is designed primarily for human habitation or use within a VHFHSZ. A typical landscape/fuel modification installation per the County's Fire Code consists of a total of 200 feet of FMZ with a 30-foot-wide Zone A, a 70-foot-wide Zone B and a 100-foot-wide Zone C.

2 Project Site Risk Analysis

2.1 Environmental Setting and Field Assessment

After review of available digital Study Area information, including topography, vegetation types, fire history, and the Project's Development Footprint, a Dudek Fire Protection Planner conducted a Project site evaluation on June 15, 2020, in order to confirm/acquire site information, document existing site conditions, and to determine potential actions for addressing the protection of the Project's structures. While on-site, Dudek's Fire Planner assessed the area's topography, natural vegetation, and fuel loading, surrounding land use, and general susceptibility to wildfire. Among the field tasks that were completed included:

- Topography evaluation;
- Vegetation/fuel assessments;
- Photograph documentation of the existing condition;
- Confirmation/verification of hazard assumptions;
- Off-site, adjacent property fuel and topography conditions;
- Surrounding land use confirmations;
- Necessary fire behavior modeling data collection;
- Ingress/egress documentation;
- Nearby Fire Station reconnaissance.

Study Area photographs were collected (refer to Appendix A, *Representative Site Photograph*s), and fuel conditions were mapped using aerial images. Field observations were utilized to augment existing site data in generating the fire behavior models and formulating the requirements and recommendations detailed in the FPP.

2.2 Site Characteristics and Fire Environment

Fire environments are dynamic systems and include many types of environmental factors and site characteristics. Fires can occur in any environment where conditions are conducive to ignition and fire movement. Areas of naturally vegetated open space are typically comprised of conditions that may be favorable to wildfire spread. The three major components of the fire environment are topography, vegetation (fuels), and climate. The state of each of these components and their interactions with each other determines the potential characteristics and behavior of a fire at any given moment. It is important to note that wildland fire may transition to urban fire if structures are receptive to ignition. Structure ignition depends on a variety of factors and can be prevented through a layered system of protective features including fire-resistive landscapes directly adjacent to the structure(s), application of known ignition resistive materials and methods, and suitable infrastructure for firefighting purposes. Understanding the existing wildland vegetation and urban fuel conditions on and adjacent to the site is necessary to understand the potential for fire within and around the Project site.

The following sections discuss the characteristics of the Project area and the surrounding region. The intent of evaluating conditions at a macro-scale provides a better understanding of the regional fire environment, which is not constrained by property boundary delineations.

2.2.1 Topography

Topography influences fire risk by affecting fire spread rates. Typically, steep terrain results in faster fire spread up-slope and slower spread down-slope. Terrain that forms a funneling effect, such as chimneys, chutes, or saddles on the landscape can result in especially intense fire behavior. Conversely, flat terrain tends to have little effect on fire spread, resulting in fires that are driven by vegetation and wind.

The Project site is located in the northern foothills of the Santa Susana Mountains and is bisected by Lyons Canyon, which located in the central portion of the Project site, drains eastward into the South Fork of the Santa Clara River, which flows to the Santa Clara River approximately 3.75 miles northeast of the Project site. The topography of the Project site is characterized by hillside and valley terrain with moderate to steep slopes. A significant ridgeline is designated in the southern portion of the Project Site within the proposed onsite retained open space. Elevations in the Project Site range from approximately 1,654 feet amsl at the southwest corner to approximately 1,300 feet amsl at the northeast corner. The Project site has been previously disturbed by several fires in past years.

Topographic features that may present a fire spread facilitator are the slope and canyon alignments, which may serve to funnel or channel winds, thus increasing their velocity and potential for influencing wildfire behavior. From a regional perspective, the alignment of tributary canyons and dominant ridges is conducive to channeling and funneling wind, thereby increasing the potential for more extreme wildfire behavior in the region.

2.2.2 Climate

The Project site, like much of Southern California, is influenced by the Pacific Ocean and a seasonal, migratory subtropical high-pressure cell known as the “Pacific High.” Wet winters and dry summers with mild seasonal changes characterize the Southern California climate. This climate pattern is occasionally interrupted by extreme periods of hot weather, winter storms, or dry, easterly Santa Ana winds. The average high temperature for the Project area is approximately 77°F, with an average temperature in the summer and early fall months (July–October) of 88°F. July and August are typically considered the hottest months of the year. The area is considered to be a semi-arid climate. Annual precipitation typically averages approximately 18 inches annually with the wettest months being January and February (Western Regional Climate Center, 2021).

From a regional perspective, the fire risk in southern California can be divided into three distinct “seasons” (Nichols et al. 2011, Baltar et al 2014). The first season, the most active season and covering the summer months, extends from late May to late September. This is followed by an intense fall season characterized by fewer but larger fires. This season begins in late September has historically continued into November or later. The remaining months, through May include the mostly dormant, and wetter winter season. Mensing et al. (1999) and Keeley and Zedler (2009) found that large fires in the region consistently occur at the end of wet periods (i.e., several rainy years) and the beginning of droughts (i.e., several dry years). Typically, the highest fire danger in southern California coincides with Santa Ana winds. The Santa Ana wind conditions are a reversal of the prevailing southwesterly winds that usually occur on a region-wide basis near the end of fire season during late summer and early fall, prior to the onset of winter precipitation, but have also occurred in the spring. Santa Anas are dry, warm winds that flow from the higher desert elevations in the east through the mountain passes and canyons at average speeds of about 40 miles per hour and peak gusts recorded at 104 miles per hour (AccuWeather 2022). As the winds converge through the canyons, their velocities increase. Localized wind patterns on the Project site are strongly affected by both regional and local topography.

The prevailing wind pattern is from the west (on-shore), but the presence of the Pacific Ocean causes a diurnal wind pattern known as the land/sea breeze system. During the day, winds are from the west–southwest (sea), and at night winds are from the northeast (land). The highest wind velocities are associated with downslope, canyon, and Santa Ana winds. The Project site includes topography that would create unusual weather conditions, thus the Project site is subject to periodic extreme fire weather conditions that occur throughout foothill portions of Los Angeles County.

2.2.3 Vegetation

The Project property and surrounding areas primarily support chaparral, coastal sage scrub, riparian woodlands, and non-native grassland plant communities. The adjacent lands have similar vegetation types, with non-native grasslands as well. The vegetation cover types were assigned a corresponding fuel model for use during site fire behavior modeling. Section 3.0 describes the fire modeling conducted for the Project area.

Extensive vegetation type mapping is useful for fire planning because it enables each vegetation community to be assigned a fuel model, which is used in a software program to predict fire behavior characteristics, as discussed in Section 3.1, Fire Behavior Modeling. Vegetative fuels on-site are characteristic of the area and are primarily mixed chaparral and coastal sage scrub habitats and more concentrated trees within the property riparian habitat. Man-made land cover types, such as disturbed land were also observed. The area proposed for development and within the Project grading limits will be converted to ignition resistant landscapes, roads, structures, and landscaped vegetation following Project completion. Vegetative fuels within proposed fuel modification zones will be removed or structurally modified as a result of development, altering their current structure and species composition, irrigation and maintenance levels, resulting in a perimeter wildfire buffer.

Post-development vegetation composition proximate to the Project footprint is expected to be significantly different than current conditions. Following build-out, irrigated landscape vegetation associated with fuel modification zones (FMZ) A and B, and thinned vegetation associated with Zone C would be located in the immediate area surrounding the Project's Development Footprint, extending 200 horizontal feet from each of the structures; however, per LACoFD, where 200-feet of FMZ is not achievable onsite the neighboring property owner will be responsible for brush clearance to achieve the full 200-feet. In keeping with the Project's conservative approach, although not required by LACoFD, enhanced construction features (e.g., 6-ft fire wall) will be implemented in the southwest portion (eastern boundary) of the Project site adjacent to the 16 structures where onsite FMZ will range from 35 to 75 feet (but total FMZ will be 200 feet with off-site brush clearance). Consistent with requirements, native and naturalized vegetation occurring within FMZ Zone C is not expected to be irrigated, although overall fuel volumes will be reduced by removing dead and dying plants, non-natives, highly flammable species, and thinning the remaining plants so they would not readily facilitate the spread of fire on an ongoing basis. The Project's Landscape Plan (Supernatural 2023) will provide details regarding the type, number and location of proposed plants and trees post-development, for the purpose of this FPP vegetation within Zones A and B is irrigated and in compliance with LACoFD standards, as described in Section 3.2. The provided FMZ areas will be maintained on an ongoing basis in order to comply with LACoFD's Fuel Modification Plan guidelines.

2.2.3.1 Vegetative Fuel Dynamics

The vegetation characteristics described above are used to model fire behavior, discussed in Section 3.0 of this FPP. Variations in vegetative cover type and species composition have a direct effect on fire behavior. Some plant communities and their associated plant species have increased flammability based on plant physiology (resin content), biological function (flowering, retention of dead plant material), physical structure (bark thickness, leaf size, branching patterns), and overall fuel loading. For example, non-native grass-dominated plant communities become seasonally prone to ignition and produce lower intensity, higher spread rate fires. In comparison, sage scrub can produce higher heat intensity and higher flame lengths under strong, dry wind patterns, but does not typically ignite or spread as quickly as light, flashy grass fuels.

As described, vegetation plays a significant role in fire behavior, and is an important component of fire behavior models discussed in the report. A critical factor to consider is the dynamic nature of vegetation communities. Fire presence and absence at varying cycles or regimes disrupts plant succession, setting plant communities to an earlier state where less fuel is present for a period of time as the plant community begins its succession again. In summary, high-frequency fires tend to convert shrublands to grasslands or maintain grasslands, while fire exclusion tends to convert grasslands to shrublands, over time. In general, biomass and associated fuel loading will increase over time, assuming that disturbance (fire, or grading) or fuel reduction efforts are not diligently implemented. It is possible to alter successional pathways for varying plant communities through manual alteration. This concept is a key component in the overall establishment and maintenance of the proposed fuel modification zones on-site. The Project's onsite FMZs will consist of irrigated and maintained landscapes as well as thinned native fuel zones that will be subject to regular "disturbance" in the form of maintenance and will not be allowed to accumulate excessive biomass over time, which results in reduced fire ignition, spread rates, and intensity. Offsite brush clearance would occur in areas where the full 200 foot FMZ is not achievable onsite, specifically along the northern boundary, the southeastern boundary and the eastern boundary. The offsite brush clearance needed along the northern and southeastern boundary is minimal, requiring no more than 50 feet. However, along the eastern boundary offsite brush clearance would be up to 146 feet. Conditions adjacent to the Project's footprint (outside the fuel modification zones), where the wildfire threat will exist post-development, are classified as moderate to high fuel loads due to the dominance of sparse chaparral and sage scrub-grass fuels.

The vegetation described above translates to fuel models used for fire behavior modeling, discussed in Chapter 3 of this FPP. Variations in vegetative cover type and species composition have a direct effect on fire behavior. For example, California sagebrush scrub can produce higher heat intensity and higher flame lengths under strong, dry wind patterns, but does not typically ignite or spread as quickly as light, flashy grass fuels. The corresponding fuel models for each of these vegetation types are designed to capture these differences. Vegetation distribution throughout the Project site varies by location and topography. Areas, where the Project's Development Footprint is located, are primarily sparse chaparral or coastal sage scrub cover.

In summary, high-frequency fires tend to convert shrublands to grasslands or maintain grasslands, and fire exclusion tends to convert grasslands to shrublands over time as shrubs sprout back or establish and are not disturbed by repeated fires. In general, biomass and associated fuel loading will increase over time, assuming that disturbance (e.g., fire) or fuel reduction efforts are not diligently implemented. It is possible to alter successional pathways for varying plant communities through manual alteration. This concept is a key component in the overall establishment and maintenance of the proposed FMZs for the Project site. The FMZs will consist of irrigated and maintained landscapes that will be subject to regular "disturbance" in the form of maintenance and will not be allowed to accumulate excessive biomass over time, which results in reduced fire ignition, spread rates, and intensity.

2.2.4 Fire History

Fire history is an important component of a site-specific FPP. Fire history data provides valuable information regarding fire spread, fire frequency, ignition sources, and vegetation/fuel mosaics across a given landscape. One important use for this information is as a tool for pre-planning. It is advantageous to know which areas may have burned recently and therefore may provide a tactical defense position, what type of fire burned on the Project site, and how a fire may spread.

Fire history represented in the FPP uses the California Department of Forestry and Fire Protection (CAL FIRE) Fire and Resource Assessment Program (FRAP) database. FRAP summarizes fire perimeter data dating to the late 1800s, but which is incomplete due to the fact that it only includes fires over 10 acres in size and has incomplete perimeter data, especially for the first half of the 20th century (Syphard and Keeley 2016). However, the data does provide a summary of recorded fires and can be used to show whether large fires have occurred in the Project area, which indicates whether they may be possible in the future.

According to available data from the CAL FIRE in the FRAP database, one hundred seventy-three (173) fires have burned within 5 miles of the Project site since the beginning of the historical fire data record. Recorded wildfires within 5 miles range from <0.1 acres to 115,537 acres (1970 Clampitt Fire) and the average fire size is approximately 2,950. When considering only fires greater than 10 acres and less than 100,000, the average fire size is approximately 1,864.6 acres. The 2020 Elsmere Fire (approximately 159.2 acres), 2020 Calgrove Fire (approximately 4.2 acres), and 2019 Saddle Ridge Fire (approximately 8,799.3 acres are the most recent fires. Seven fires have burned on the Project site, most recently the 2016 Sage Fire (approximately 850.9 acres) burned 216.5-acres on-site. LACoFD may have data regarding smaller fires (less than 10 acres) that have occurred on-site that have not been included herein. Fire history for the general vicinity of the Project site is illustrated in Appendix B, Fire History Map.

Based on an analysis of the fire history data set, specifically, the years in which the fires burned, the average interval between wildfires within 5 miles of the Project site was calculated to be less than one with intervals ranging between 0 (multiple fires in the same year) to 10 years. Based on the analysis, it is expected that there will be wildland fires within 5 miles of the Project site at least every 10 years and on average, every year, as observed in the fire history record. Based on fire history, wildfire risk for the Project site is associated primarily with a Santa Ana wind-driven wildfire burning or spotting on-site from the northeast or east, although a fire approaching from the southwest or west during more typical on-shore weather patterns is possible. The proximity of the Project to large expanses of open space to the west and south and the terrain within the Angeles National Forest, including multiple sub-drainages and canyons, has the potential to funnel Santa Ana winds, thereby increasing local wind speeds and increasing wildfire hazard in the Project vicinity.

2.2.5 Analysis of Wildfire Risk from Adding New Residents

Humans (i.e., human related activities or human created features, services, or processes) are responsible for the majority of California wildfires (Syphard et al. 2007, 2008; Romero-Calcerrada et al. 2008). Certain human activities result in sparks, flames, or heat that may ignite vegetative fuels without proper prevention measures in place. These ignitions predominantly occur as accidents, but may also be purposeful, such as in the case of arson. Roadways are a particularly high source for wildfire ignitions due to high usage and vehicle caused fires (catalytic converter failure, overheated brakes, dragging chains, tossed cigarette, and others) (Harris 2019; Dudek 2008). In Southern

California, and Los Angeles County, the population living at, working in, or traveling through the wildland urban interface is vast and provides a significant opportunity for ignitions every day. However, it is a relatively rare event when a wildfire occurs, and an even rarer event when a wildfire escapes initial containment efforts. Approximately 90 to 95 percent of wildfires are controlled below 10 acres (CAL FIRE 2019; Santa Barbara County Fire Department 2019).

Research indicates that the type of clustered, master planned developments, like Lyons Canyon, are not associated with increased vegetation ignitions. Syphard and Keeley (2015) summarize all wildfire ignitions included in the CAL FIRE Fire and Resource Assessment Program (FRAP) database – dating back over 100 years. They found, in the case of one Southern California county (San Diego County), equipment-caused fires were by far the most numerous, and these also accounted for most of the area burned, followed closely by the area burned by power line fires. This pattern is consistent beyond San Diego County and is applicable in Los Angeles County. Ignitions classified as equipment caused frequently resulted from exhaust or sparks from power saws or other equipment with gas or electrical motors, such as lawn mowers, trimmers or tractors and associated with lower density housing. In San Diego County, and in areas like Lyons Canyon in Los Angeles County, ignitions were more likely to occur close to roads and structures, and at intermediate structure densities. The Project will comply with LACoFD requirements for activities in Hazardous Fire Areas and would prepare a construction fire prevention plan (CFPP) prior to commencement of construction activities, which will designate fire safety measures to reduce the possibility of fires during the construction phase. The CFPP may include the following measures: fire watch/ fire guards during hot works and heavy machinery activities, hose lines attached to hydrants or a water tender, Red flag warning weather period restrictions, required on-site fire resources, and others as determined necessary. This would reduce the likelihood of equipment caused ignitions starting onsite and impacting the surrounding areas during construction. During operation, all of the fire protection features described throughout this FPP provide a redundant layering of protection, which would reduce the likelihood of equipment caused ignitions starting onsite and impacting the surrounding areas.

As figures 4 through 6 illustrate, housing density directly influences susceptibility to fire because in higher density developments, there is one interface (the community perimeter) with the wildlands whereas lower density development creates more structural exposure to wildlands, less or no ongoing landscape maintenance (an intermix rather than interface), and consequently more difficulty for limited fire resources to protect well-spaced homes. The intermix includes housing amongst the unmaintained fuels whereas the proposed project converts all fuels within the footprint and provides a wide, managed fuel modification zone separating homes from unmaintained fuel and creating a condition that makes defense easier. Syphard and Keeley go on to state that "The WUI, where housing density is low to intermediate is an apparent influence in most ignition maps" further enforcing the conclusion that lower density housing poses a higher ignition risk than higher density communities. They also state that "Development of low-density, exurban housing may also lead to more homes being destroyed by fire" (Syphard et al. 2013). A vast wildland urban interface already exists in the area adjacent to Lyons Canyon, with older, more fire-vulnerable structures, constructed before stringent fire code requirements were imposed on residential development, with varying levels of maintained fuel modification buffers in the area. As discussed in detail throughout this FPP, Lyons Canyon is a planned ignition resistant community designed to include professionally managed and maintained fire protection components, modern fire code compliant safety features and specific measures provided where ignitions are most likely to occur (such as roadways). Therefore, the development of the Lyons Canyon Project would not be expected to materially increase the risk of vegetation ignitions.

Figure 4. Example higher density development. Homes are ignition resistant and excludes readily ignitable vegetative fuels throughout and provides a perimeter fuel modification zone. This type of new development requires fewer fire resources to defend and can minimize the likelihood of on-site fires spreading off-site.

Figure 5. Example of "moderate density" development. Homes are located on larger properties and include varying levels of ignition resistance and landscape / fuel modification provision and maintenance. This type of development results in a higher wildland exposure level for all homes and does not provide the same buffers from wildfire encroaching onto the site, or starting at a structure and moving into the wildlands as a higher density project.

Figure 6. Example of "lower density" development. Homes are interspersed amongst wildland fuels, are of varying ages, and include varying levels of fuel modification zone setbacks. Homes are exposed on most or all sides by flammable vegetation and properties rely solely on owners for maintenance, are often far distances from the nearest fire station, and have minimal buffer from on-site fire spreading to wildlands.

Moreover, frequent fires and lower density housing growth may lead to the expansion of highly flammable exotic grasses that can further increase the probability of ignitions (Keeley et al. 2012). This is not the case with the proposed project as the landscapes are managed and maintained to remove exotic fuels that may establish over time.

As discussed above, research indicates that it is less likely for higher density developments to be impacted by wildfires than lower density developments. The same protections that starve wildfire of fuels and minimize or prevent wildfire from transitioning into a higher density community or moderate density with high maintenance levels, such as Lyons Canyon's also serve to minimize or prevent on-site fires from transitioning into the wildlands. Further, the requirement that all structures will include interior fire sprinklers significantly reduces the likelihood that a building fire spreads to the point of flashover, where a structure will burn beyond control and produce embers. Interior sprinklers are very efficient, keeping fires to the room of origin, or extinguishing the fire before the responding firefighters arrive. Similarly, the irrigated fuel modification zones are positioned throughout the development areas as well as the first zones on the perimeter of the project. Irrigated zones include plants with high internal moisture and spacing between plants and plant groups that 1) make it difficult to ignite and 2) make it difficult for fire to spread plant to plant. Additionally, the existing electrical transmission lines (particularly the distribution lines, which are strung at lower heights to provide power to buildings, and therefore, can come into contact with trees and other vegetation) within the Project footprint, where trees and other plantings could grow or fall into the lines and create an existing potential fire ignition threat. As a part of Project construction, these distribution lines would be removed during grading and all new powerlines would be undergrounded. Further, existing transmission lines in areas near the Project site within ROWs that would not be removed as part of the Project are already required to receive ongoing vegetation maintenance according to California Public Utilities

Commission General Order 95 rules, and Southern California Edison has prepared a robust Wildfire Mitigation Plan to continue providing maintenance and over time, replace existing assets/hardware with ignition resistant and fire preventive features, there would be no change in the existing condition and the Project would not exacerbate the risk of wildfire associated with the existing electrical transmission lines. During construction, temporary construction powerlines shall only be installed in designated areas that have been cleared of combustible vegetation to mitigate potential wildfire risk. Lastly, additional humans on-site result in fast detection of fires and fast firefighter response, a key in limiting the growth of fires beyond the incipient stage.

2.2.6 Fire Protection Features' Beneficial Effect on Wildfire Ignition Risk Reduction

Each of the fire protection features provided as part of the code requirements or customized for this Project are based on the FPP's evaluation work to protect the Project site, its structures and their occupants from wildfires as well as reduce the risk of wildfire originating from the Project site and spreading to existing development. These features also have a similar positive impact on the potential for wildfire ignitions caused by the Project and its inhabitants.

As mentioned previously, the ignition resistant landscapes and structures and the numerous specific requirements would minimize the ability for an on-site fire to spread to off-site fuels, as follows:

1. **Ignition resistant, planned and maintained landscape** – all site landscaping of common areas and fuel modification zones will be subject to strict plant types that are lower ignition plants with those closest to structures requiring irrigation to maintain high plant moistures which equates to difficult ignition. These areas are closest to structures, where ignitions would be expected to be highest, but will be prevented through these ongoing maintenance efforts.
2. **Fuel Modification Zone around perimeter of project** – where achievable onsite the FMZ is 200 feet and where not achieved on site the adjacent property owner will provide brush clearing to make up the difference. The onsite FMZ varies between 54 and 200 feet wide, which includes specifically selected plant species, very low fuel densities (only 30% retention of native plants in outer zones and irrigated inner zones), and ongoing HOA funded and applied maintenance, resulting in a wide buffer between the developed areas and the off-site native fuels. Where less than 100 feet of onsite FMZ is provided, additional fire protection features are provided to compensate and provide the same level of protection.
3. **Annual FMZ inspections** – the Lyons Canyon HOA's CCRs shall require annual fuel modification inspections to be conducted to confirm and document compliance with fuel modification maintenance requirements, as defined in the Los Angeles County Fire Department (LACoFD)-approved Fuel Modification Plan. The HOA shall obtain a fuel modification zone (FMZ) inspection and report in May/June of each year to document and certify that vegetation management activities throughout the Project site have been performed. If the onsite FMZ areas are not compliant, the HOA shall have a specified period to correct any noted issues, and re-inspection shall be required to achieve the annual certification of compliance. Documentation of compliance shall be retained by the HOA. Offsite brush clearance will be inspected and enforced by LACoFD.
4. **Ignition resistant structures** – all structures will be built to the Chapter 7A (CBC) ignition resistant requirements that have been developed and codified as a direct result of after fire save and loss assessments. These measures result in homes that are designed, built and maintained to withstand fire and embers associated with wildfires. It must be noted that the wide FMZs would not result in wildfire directly next to these structures. Homes and buildings can be built in the VHFHSZs and WUI areas when they are part of an overall approach that contemplates wildfire and provides design features that address

the related risk. A structure within a VHFHSZ that is built to these specifications can be at lower risk than an older structure in a non-fire hazard severity zone. The ignition resistance of on-site structures would result in a low incidence of structural fires, further minimizing potential for project-related wildfires.

5. **Interior fire sprinklers** – sprinklers in residences are designed to provide additional time for occupants to escape the home. Sprinklers in multi-family and commercial structures are designed to provide structural protection. The common benefit of fire sprinklers is that they are very successful at assisting responding firefighters by either extinguishing a structural fire or at least, containing the fire to the room of origin and delaying flash over. This benefit also reduces the potential for an open space vegetation ignition by minimizing the possibility for structure fires to grow large and uncontrollable, resulting in embers that are blown into wildland areas. This is not the case with older existing homes in the area that do not include interior sprinklers.
6. **Fire access roads** – roads provide access for firefighting apparatus. Project roads provide code-consistent access throughout the community. Better access to wildland areas may result in faster wildfire response and continuation of the fire agencies' successful control of wildfires at small sizes.
7. **Powerlines** - All new permanent powerlines would be undergrounded for fire safety purposes, which would eliminate the risk of ignitions via contact between transmission lines and tree canopies, other vegetation, etc.
8. **Nearby Fire station** – the nearby fire station will result in fast response and additional resources for LACoFD. Fires, whether onsite or in the open space, will receive fast response, which is important for successful containment and in the case of fires occurring during extreme fire weather, for fast size up and additional resource requests.
9. **Water** – providing firefighting water throughout the Project with hundreds of fire hydrants accessible by fire engines is a critical component of both structural and vegetation fires. The Project provides firefighting water volume, availability and sustained pressures to the satisfaction of LACoFD. Water accessibility helps firefighters control structural fires and helps protect structures from and extinguish wildfires.

3 Anticipated Fire Behavior

3.1 Fire Behavior Modeling

Following field data collection efforts and available data analysis, fire behavior modeling was conducted to document the type and intensity of the fire that would be expected adjacent to the Project site given characteristic features such as topography, vegetation, and weather. Dudek utilized BehavePlus software package version 6 (Andrews, Bevins, and Seli 2008) to analyze potential fire behavior[3].

3.2 Fire Behavior Modeling Analysis

An analysis was conducted to evaluate fire behavior variables and to objectively predict flame lengths, intensities, and spread rates for five modeling scenarios, including two summer, onshore weather condition (northwest and west/southwest from the Project Site) and three extreme fall, offshore weather condition (east, southeast, and south of the Project Site). These fire scenarios incorporated observed fuel types representing the dominant vegetation representative of the site and adjacent land, in addition to slope gradients, wind, and fuel moisture values. Modeling scenario locations were selected to better understand different fire behavior that may be experienced on or adjacent to the site.

Vegetation types, which were derived from the field assessment for the Project site and the Project's On-site Vegetation Map (Figure 7), were classified into a fuel model. Fuel models are selected by their vegetation type, fuel stratum most likely to carry the fire, and depth and compactness of the fuels. Fire behavior modeling was conducted for vegetative types that are both on and adjacent to the proposed development. Fuel models were also assigned to illustrate post-Project fire behavior changes. Fuel models were selected from Standard Fire Behavior Fuel Models: a Comprehensive Set for Use with Rothermel's Surface Fire Spread Model (Scott and Burgan 2005).

Based on the anticipated pre- and post- Project vegetation conditions, six different fuel models were used in the current conditions of the fire behavior modeling effort and two additional fuel models were used to depict a fire post construction, as present herein. Modeled areas include Coast live oak stands with non-native chaparral and shrub understory (Fuel Model SH4 = Timber-Shrub) occur along western and southern borders of the site. Mature tree canopies for coast live oak trees (*Quercus agrifolia)* are assumed to have a canopy base height ranging from 20 to 35 feet off the ground. Canopy bulk density, the weight of canopy fuels per cubic foot of volume, is assumed to be the maximum allowable value in BehavePlus to represent broadleaf trees which, given canopy density and leaf size, have more weight per area than conifer trees (the standard for this value input in BehavePlus (Heinsch and Andrews 2010)). Foliar moisture, the moisture content of canopy foliage, is assumed to be 100%, a reasonable estimate in lieu of site-specific data (Scott and Reinhardt 2001). Table 1 provides a description of the fuel models observed that were subsequently used in the analysis for the Project. For modeling the post-development condition, fuel model assignments were re-classified to FM8 representing an irrigated landscape, Gs1, representing a low load, irrigated, grass shrub landscape, and Gs2, 50% thinning grass-shrub landscape up to 200 feet from the structures.

[3] A discussion of fire behavior modeling is presented in Appendix C, Fire Behavior Modeling.

Table 1. Fuel Models Used for Fire Behavior Modeling

Fuel Model	Description	Location of Fuel Models	Fuel Bed Depth (Feet)
Existing Conditions			
Gr4	Moderate load, Dry climate grasses	Fuel type throughout and adjacent to the western side of the Project boundary	>2.0 ft.
Gr7	High load, Dry climate grasses	Fuel type throughout and adjacent to the western side of the Project boundary	>5.0 ft.
Gs2	Moderate load, Dry Climate Grass-Shrub	Fuel type throughout and adjacent to the Project boundary; also will occur post development within Zone C - 50% thinning zone.	<3.0 ft.
Sh2	Moderate load, Dry Climate Shrub	Fuel type throughout and adjacent to the Project boundary	>3.0 ft.
Sh4	Coast Live Oak Trees (Timber Shrub)	Within the foothills west/northwest of the Project site and western property boundary, as well in the southern portion of the Project site.	<6.0 ft.
Sh5	High Load, Dry Climate Shrub	Fuel type throughout and adjacent to the Project boundary.	>4.0 ft.
Post-Development Conditions			
FM8	Irrigated Landscape	Fuel type will occur post development within Zone A - setback irrigated zone.	<1.0 ft.
Gs1	Low Load, Dry Climate Grass-Shrub	Fuel type will occur post development within Zone B - Irrigated zone.	<2.0 ft.
Gs2	Moderate load, Dry Climate Grass-Shrub	Fuel type throughout and adjacent to the Project boundary; also will occur post development within Zone C - 50% thinning zone.	<3.0 ft.

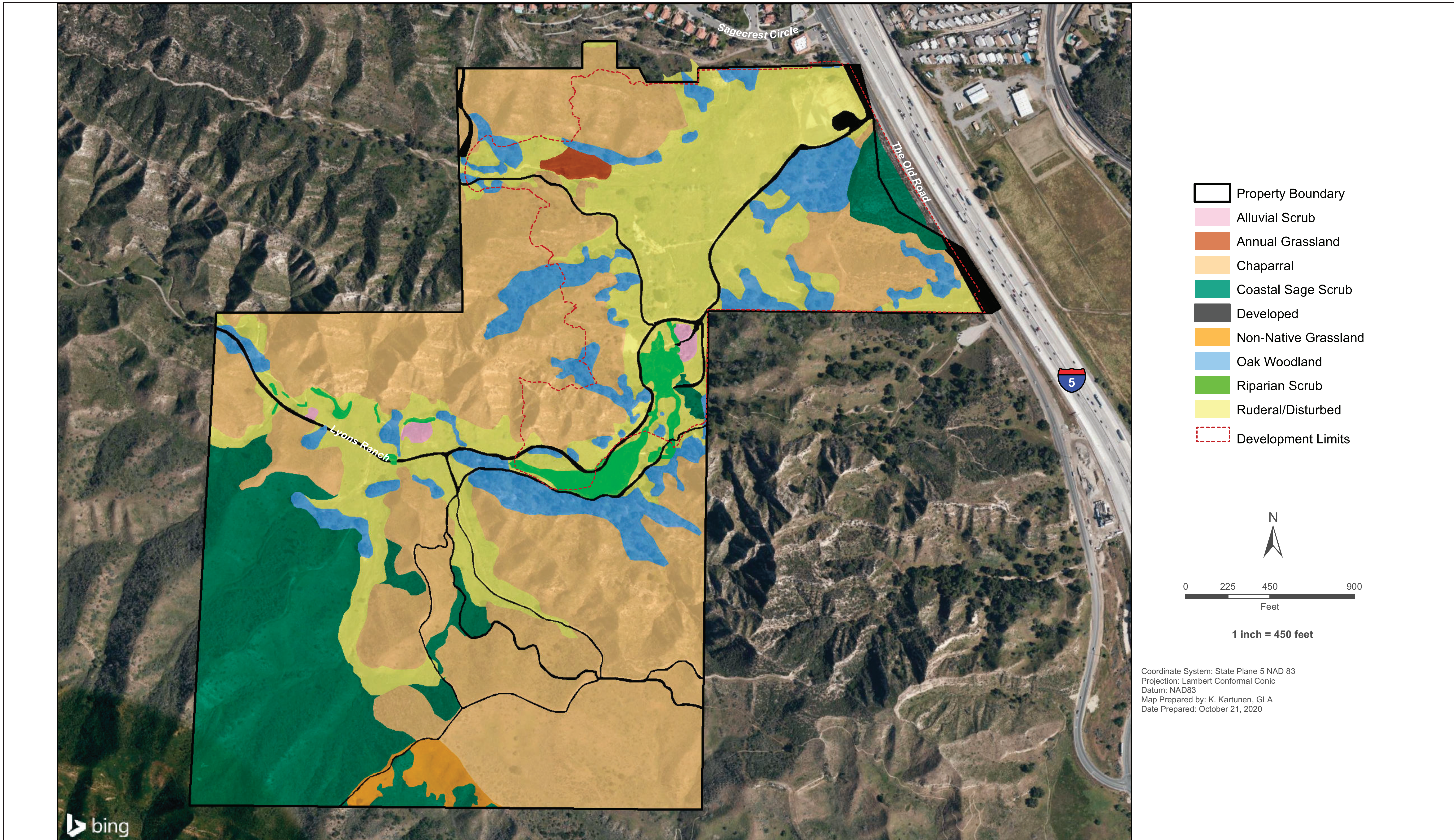
Source: Scott, J.H., Burgan, R.E. 2005.

Table 2 summarizes the weather and wind input variables used in the BehavePlus modeling process.

Table 2. Fuel Moisture and Wind BehavePlus Model Inputs

Model Variable	Summer Weather Condition (50th Percentile)	Peak Fall Weather Condition (97th Percentile)
Fuel Models	Gr4, Gr7, Gs2, Sh2, and Sh4 (Pre) FM8, Gs1, and Gs2 (Post)	Gs2, Sh4, and Sh5 (Pre) FM8, Gs1, and Gs2 (Post)
1 hr. Moisture	5	1
10 hr. Moisture	7	2
100 hr. Moisture	11	4
Live Herbaceous Moisture	45	30
Live Woody Moisture	90	60
20-foot Wind Speed (mph)	14 mph (sustained winds)	18 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	240 and 310	80, 145, and 180
Wind adjustment factor	0.4	0.4
Slope (uphill)	9 to 18%	16 to 22%

Source: Andrews, Patricia L. 2009



SOURCE: GLENN LUKOS ASSOCIATES, 2020

DUDEK

Vegetation Map

Lyons Canyon Fire Protection Plan

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3.3 Fire Behavior Modeling Results

The results of fire behavior modeling analysis for pre- and post-Project conditions are presented in Table 3 and Table 4, respectively. Identification of modeling run (fire scenarios) locations is presented graphically in Figure 8, BehavePlus Fire Behavior Analysis.

As presented, in the Fire Behavior Analysis (Appendix C), wildfire behavior on the Project site is expected to be primarily of moderate to high intensity throughout the non-maintained chamise chaparral and sage scrub-dominated fuels northwest, east, southeast, south, and southwest/west of the Project site. As mentioned, the BehavePlus fire behavior modeling software package was utilized in evaluating anticipated fire behavior adjacent to the Proposed Project site. Five focused analyses were completed, each assuming worst-case fire weather conditions for a fire approaching the project site from the northwest, east/northeast, southeast, south, and west/southwest. The results of the modeling effort included anticipated values for surface fires (flame length (feet), rate of spread (mph), and fireline intensity (Btu/ft/s)) and crown fires (critical surface intensity (Btu/ft/s), critical surface flame length (feet), transition ratio (ratio: surface fireline intensity divided by critical surface intensity), transition to crown fire (yes or no), crown fire rate of spread (mph), critical crown rate of spread (mph), active ratio (ratio: crown fire rate of spread divided by critical crown fire rate of spread), active crown fire (yes or no), and fire type (surface, torching, conditional crown, or crowning)). The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews, Bevins, and Seli 2008). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts (Rothermel and Rinehart 1983). Spotting distance is the distance a firebrand or ember can travel down wind and ignite receptive fuel beds. Four fire modeling scenario locations were selected to better understand the different fire behavior that may be experienced on or adjacent the site based on slope and fuel conditions; these four fire scenarios are explained in more detail below:

Fire Scenario Locations and Descriptions:

- **Scenario 1:** A summer, on-shore fire (50th percentile weather condition) burning in moderate-load chaparral and shrubs and through the understory vegetation beneath off-site coast live oak tree community's northwest of the Project site. The terrain is moderately steep (18% slope) with potential ignition sources from a wildfire originating in the open space areas to the northwest. This type of fire would typically spread downhill towards existing residential communities north of the proposed site before reaching the Project site.
- **Scenario 2:** A fall, off-shore fire (97th percentile weather condition) burning in the moderate to high-load chapparal intermixed with grass-shrubs along the Interstate 5 (I-5) freeway east of the proposed project site. The terrain is moderately steep (up to 22% slope) with potential ignition sources from a vehicle fire along I-5 or a house fire from the existing residential communities to the east/northeast. This type of fire would typically spread downhill towards the proposed Project site.
- **Scenario 3:** A fall, off-shore fire (97th percentile weather condition) burning in moderate to high-load chaparral and shrubs and through the understory vegetation beneath off-site coast live oak tree

community's southwest of the proposed Project site. The terrain is moderately steep (16% slope) with potential ignition sources from a vehicle fire along I-5 to the east/southeast and/or a wildfire originating in the open space areas to the south/southeast. This type of fire would typically spread downhill towards the proposed Project site.

- **Scenario 4:** A fall, off-shore fire (97th percentile weather condition) moderate to high-load chaparral chapparal intermixed with grass-shrubs south of the proposed Project site. The terrain is moderately steep (17% slope) with potential ignition sources from a wildfire originating in the open space areas to the south. This type of fire would typically spread downhill towards the proposed Project site.
- **Scenario 5:** A summer, on-shore fire (50th percentile weather condition) moderate-load chaparral and shrubs southwest/west of the Project site. The terrain is moderately steep (9% slope) with potential ignition sources from a wildfire originating in the open space areas to the west/southwest. This type of fire would typically spread downhill towards the proposed Project site.

The results presented in Tables 4 and 5 depict values based on inputs to the BehavePlus software and are not intended to capture changing fire behavior as it moves across a landscape. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. For planning purposes, the averaged worst-case fire behavior is the most useful information for conservative fuel modification design. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

3.3.1 Existing Conditions

Based on the BehavePlus analysis result presented below and in Tables 3 and 4, worst-case fire behavior is expected in untreated, surface shrub and chaparral fuels south/southwest of the proposed Project site under Peak weather conditions (represented by Fall Weather, Scenario 3). The analyzed worse-case fire is anticipated to be a wind-driven fire from the east during a fall, Santa Ana wind event. Under such conditions, predicted surface flame lengths would be approximately 25 feet under 18 mph sustained winds and could reach up to 45 feet under wind speeds of up to 50-plus mph. Under this scenario, fireline intensities reach 21,884 BTU/feet/second with fast spread rates of 6.8 mph and could have a spotting distance up to 2.4 miles away.

Fires burning from the west/northwest and pushed by ocean breezes typically exhibit less severe fire behavior due to lower wind speeds and higher humidity. Under typical onshore weather conditions, a chaparral scrub fire could have flame lengths between approximately 11 feet and 22 feet in height and spread rates between 0.1 and 2.0 mph. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.2 to 0.6 miles.

Table 3. RAWS BehavePlus Fire Behavior Modeling Results – Existing Conditions

Fire Scenario	Flame Length[1] (Feet)	Spread Rate[1] (MPH[5])	Fireline Intensity[1] (Btu/ft./sec.)	Spot Fire[1] (miles)	Surface Fire to Tree Crown Fire	Tree Crown Fire Rate of Spread (MPH[5])	Crown Fire Flame Length (feet)
Scenario 1: 18% slope; Summer Onshore Wind from northwest (50th percentile)							
Coast Live Oak Trees[2,3] (Sh4)	7.5	0.4	447	0.3	Crowning [4]	0.5	67.3
Moderate-load Sagebrush scrub (Sh2)	3.6	0.1	93	0.2	Crowning [4]	0.5	68.1
Moderate-load Grass-Shrub (Gs2)	5.7	0.4	253	0.2	Crowning [4]	0.5	66.1
High-load Grasses (Gr7)	22.7	2.0	5,014	0.6	Crowning [4]	0.5	71.9
Scenario 2: 22% slope; Fall extreme offshore Wind from east (97th percentile)							
Moderate Load Grass-Shrub (Gs2)	10.7 (20.6)[6]	1.0 (4.3)	971 (4,080)	0.4 (1.4)	No	N/A	N/A
High Load Sagebrush scrub (Sh5)	26.3 (45.0)	2.1 (6.9)	6,914 (22,268)	0.8 (2.4)	No	N/A	N/A
Scenario 3: 16% slope; Fall extreme offshore Wind from southeast (97th percentile)							
Coast Live Oak Trees[2,3] (Sh4)	12.4 (23.8)[6]	1.0 (4.2)	1,357 (5,600)	0.5 (1.6)	Crowning [4]	1.1 (4.4)	119.9 (308.3)
High Load Sagebrush scrub (Sh5)	25.6 (44.6)	2.0 (6.8)	6,531 (21,884)	0.8 (2.4)	Crowning [4]	1.1 (4.4)	130.8 (336.4)
Scenario 4: 17% slope; Fall extreme offshore Wind from south (97th percentile)							
Moderate Load Grass-Shrub (Gs2)	12.4 (23.8)[6]	1.0 (4.2)	1,347 (5,590)	0.5 (1.6)	No	N/A	N/A
High Load Sagebrush scrub (Sh5)	25.5 (44.6)	2.0 (6.7)	6,486 (21,840)	0.8 (2.4)	No	N/A	N/A
Scenario 5: 9% slope; Summer Onshore Wind from west/southwest (50th percentile)							
Moderate-load Grasses (gr4)	10.7	1.4	978	0.4	No	N/A	N/A
High-load Grasses (gr7)	22.6	2.0	5,002	0.6	No	N/A	N/A
Moderate-load Grass-Shrub (Gs2)	5.7	0.4	252	0.2	No	N/A	N/A
Moderate-load sagebrush scrub (Sh2)	3.6	0.1	93	0.2	No	N/A	N/A

Note:

1. Wind-driven surface fire.
2. Coast live oak tree understory torching increases fire intensity. Modeling included canopy fuel over Sh4, which represents surface fuels beneath the tree canopies.
3. A surface fire in the mixed coast live oak forest would transition into the tree canopies generating flame lengths higher than the average tree height (25 feet). Viable airborne embers could be carried downwind for approximately 0.7 miles and ignite receptive fuels.
4. Crowning= fire is spreading through the overstory crowns.

5. MPH=miles per hour.
6. Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

3.3.2 Post-Development Conditions

As previously mentioned, Dudek conducted modeling of the Project site for post-fuel modification zones. Fuel modification zones for the Project include establishment of minimum 100-foot wide irrigated zone (30' Zone A and minimum 70' Zone B) and up to a 100-foot wide thinning zone (Zone C) on the periphery of the Project site, beginning at the structure. For modeling the post-FMZ treatment condition, the fuel model assignment for non-native grasslands was re-classified according to the specific fuels management (e.g., irrigated, fire resistive landscaping and 50% thinning) treatment.

Based on the BehavePlus analysis, post development fire behavior is expected in irrigated and replanted with plants that are acceptable with LACoFD (Zones A – FM8 and B – Gs1), as well in an area with 50% thinning of the existing shrubs (Gs2) under peak weather conditions (represented by Fall Weather, Scenario 3). Under such conditions, expected surface flame length is expected to be significantly lower, with flames lengths reaching approximately 20 feet with wind speeds of 50+ mph. Under this scenario, fire line intensities reach 4,022 BTU/feet/second with relatively slow spread rates of 4.2 mph and could have a spotting distance up to 1.4 miles away. Therefore, the typical 150-foot Fuel Modification Zone (FMZ) proposed for the Project site is approximately 7-times the flame length of the worst case fire scenario under peak weather conditions and would provide adequate defensible space to augment a wildfire approaching the perimeter of the Project site.

Table 4. RAWS BehavePlus Fire Behavior Modeling Results – Post Project Conditions

Fire Scenario	Flame Length[1] (feet)	Spread Rate[1] (MPH)[2]	Fireline Intensity (Btu/ft./sec.)	Spot Fire (miles)[3]
Scenario 1: 18% slope; Summer Onshore Wind from northwest (50th percentile)				
FMZ Zone A (FM8)	1.2	0.0	9	0.1
FMZ Zone B (Gs1)	4.0	0.3	113	0.2
FMZ Zone C (Gs2)	5.7	0.4	253	0.2
Scenario 2: 22% slope; Fall extreme offshore Wind from east (97th percentile)				
FMZ Zone A (FM8)	2.1 (3.0)[3]	0.1 (0.2)	28 (63)	0.1 (0.4)
FMZ Zone B (Gs1)	7.4 (14.0)	0.7 (3.0)	434 (1,763)	0.3 (1.1)
Scenario 3: 16% slope; Fall extreme offshore Wind from southeast (97th percentile)				
FMZ Zone A (FM8)	2.0 (3.0)	0.1 (0.2)	26 (63)	0.1 (0.4)
FMZ Zone B (Gs1)	7.2 (14.0)	0.7 (3.0)	409 (1,763)	0.3 (1.1)
FMZ Zone C (Gs2)	10.4 (20.5)	1.0 (4.2)	914 (4,022)	0.4 (1.4)
Scenario 4: 17% slope; Fall extreme offshore Wind from south (97th percentile)				
FMZ Zone A (FM8)	2.0 (3.0)	0.1 (0.2)	26 (63)	0.1 (0.4)
FMZ Zone B (Gs1)	7.1 (14.0)	0.7 (3.0)	406 (1,763)	0.3 (1.1)
FMZ Zone C (Gs2)	10.3 (20.5)	0.9 (4.2)	907 (4,015)	0.4 (1.4)
Scenario 5: 9% slope; Summer Onshore Wind from west/southwest (50th percentile)				
FMZ Zone A (FM8)	1.2	0.0	9	0.1
FMZ Zone B (Gs1)	4.0	0.3	113	0.2
FMZ Zone C (Gs2)	5.7	0.4	252	0.2

Note:

1. Wind-driven surface fire.

2. MPH=miles per hour
3. Spotting distance from a wind driven surface fire; it should be noted that the
4. Wind mph in parenthesis represent peak gusts of 50 mph

Surface Fire:

- Flame Length (feet): The flame length of a spreading surface fire within the flaming front is measured from midway in the active flaming combustion zone to the average tip of the flames.
- Fireline Intensity (Btu/ft/s): Fireline intensity is the heat energy release per unit time from a one-foot wide section of the fuel bed extending from the front to the rear of the flaming zone. Fireline intensity is a function of rate of spread and heat per unit area, and is directly related to flame length. Fireline intensity and the flame length are related to the heat felt by a person standing next to the flames.
- Surface Rate of Spread (mph): Surface rate of spread is the "speed" the fire travels through the surface fuels. Surface fuels include the litter, grass, brush and other dead and live vegetation within about 6 feet of the ground.

Crown Fire:

- Transition to Crown Fire: Indicates whether conditions for transition from surface to crown fire are likely. Calculation depends on the transition ratio. If the transition ratio is greater than or equal to 1, then transition to crown fire is Yes. If the transition ratio is less than 1, then transition to crown fire is No.
- Crown Fire Rate of Spread (mph): The forward spread rate of a crown fire. It is the overall spread for a sustained run over several hours. The spread rate includes the effects of spotting. It is calculated from 20-ft wind speed and surface fuel moisture values. It does not consider a description of the overstory.
- Fire Type: Fire type is one of the following four types: surface (understory fire), torching (passive crown fire; surface fire with occasional torching trees), conditional crown (active crown fire possible if the fire transitions to the overstory), and crowning (active crown fire; fire spreading through the overstory crowns). Dependent on the variables: transition to crown fire and active crown fire.

The information in Table 5 presents an interpretation of the outputs for five fire behavior variables as related to fire suppression efforts. The results of fire behavior modeling efforts are presented in Tables 3 and 4. Identification of modeling run locations is presented graphically in Figure 8 of this FPP.

Table 5. Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	Interpretations
Under 4 feet	Under 100 BTU/ft/s	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4 to 8 feet	100-500 BTU/ft/s	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8 to 11 feet	500-1000 BTU/ft/s	Fires may present serious control problems – torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
Over 11 feet	Over 1000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

3.4 Project Area Fire Risk Assessment

Wildland fires are a common natural hazard in most of southern California with a long and extensive history. Southern California landscapes include a diverse range of plant communities, including vast tracts of shrublands and grasslands, like those found on and adjacent to the Project Site. Wildfire in this Mediterranean-type ecosystem ultimately affects the structure and functions of vegetation communities (Keeley 1984) and will continue to have a substantial and recurring role (Keeley and Fotheringham 2003). Supporting this are the facts that 1) native landscapes, from forest to grasslands, become highly flammable each fall and 2) the climate of southern California has been characterized by fire climatologists as the worst fire climate in the United States (Keeley 2004) with high winds (Santa Ana) occurring during autumn after a six-month drought period each year. Based on this research, the anticipated growing population expanding into WUI areas, and the regions' fire history, it can be anticipated that periodic wildfires may start on, burn onto, or spot into the site. The most common type of fire anticipated in the vicinity of the Project Area is a wind-driven fire from the east/south/southeast, moving through the chaparral and sage scrub on the adjacent lands.

With the conversion of the landscape to ignition-resistant development, wildfires may still encroach upon and drop embers on the site but would not be expected to burn through the site or produce sustainable spot fires due to the lack of available fuels. Studies indicate that even with older developments that lacked the fire protections provided in the Project, wildfires declined steadily over time (Syphard, et. al., 2007 and 2013) and further, the acreage burned remained relatively constant, even though the number of ignitions temporarily increased. This is due to the conversion of landscapes to ignition resistant, maintained areas, more humans monitoring areas resulting in early fire detection and discouragement of arson, and fast response from the fire suppression resources that are located within these developing areas.

Therefore, it will be important that the latest fire protection technologies, developed through intensive research and real-world wildfire observations and findings by fire professionals, for both ignition resistant construction and for creating defensible space in the ever-expanding WUI areas, are implemented and enforced. The Project, once developed, would not facilitate wildfire spread and would reduce projected flame lengths to levels that would be manageable by firefighting resources for protecting the site's structures, especially given the ignition resistance of the structures and the planned ongoing maintenance of the entire site landscape. The Project will implement the latest fire protection measures (e.g., CBC Chapter 7A), including fuel modification along the perimeter edges of the development. In addition, the FMZs (200-foot widths) would be approximately 7 times wider than the longest calculated flame length (reference Table 4, 20.5 feet under 50+ mph gusts) for portions of the proposed developed area that abut chamise chaparral and sage scrub plant communities.

Given the climatic, vegetative, topographic characteristics, and local fire history of the area, the Project Site, once developed, is determined to be subject to periodic wildfires that may start on, burn toward, or spot into the site. The potential for off-site wildfire encroaching on, or showering embers on the site is considered moderate to high, but the risk of ignition from such encroachments or ember showers is considered low based on the type of ignition resistant landscapes and construction and fire protection features that will be provided for the structures.

While it is true that humans are the cause of most fires in California, there is no data available that links increases in wildfires with the development of ignition-resistant communities. The Project will include a robust fire protection system, as detailed in this FPP. This same robust fire protection system provides protections from onsite fire spreading to off-site vegetation, as discussed in detail in Section 2.2.6, Fire Protection Features' Beneficial Effect on Wildfire Ignition Risk Reduction. Accidental fires within the landscape or structures in the Project will have limited ability to spread. The landscape throughout the Project and on its perimeter will be highly maintained and much of it irrigated, which further reduces its ignition potential. Structures will be highly ignition resistant on the exterior and the interiors will be protected with automatic sprinkler systems, which have a very high success rate for confining fires or extinguishing them. The Project will be a fire-adapted community with a strong resident outreach program that raises fire awareness among its residents, described further in Section 7, Wildfire Education Program.

Table 2. RAWS BehavePlus Fire Behavior Modeling Results – Existing Conditions

Fire Scenario	Flame Length[1] (Feet)	Spread Rate[1] (MPH[5])	Fireline Intensity[1] (Btu/ft./sec.)	Spot Fire[1] (miles)	Surface Fire to Tree Crown Fire	Tree Crown Fire Rate of Spread (MPH)	Crown Fire Flame Length (feet)
Scenario 1: 18% slope; Summer Onshore Wind from northwest (50th percentile)							
Coast Live Oak Trees[2,3] (Sh4)	7.5	0.4	447	0.3	Crowning [4]	0.5	67.3
Moderate-load Sagebrush scrub (Sh2)	3.6	0.1	93	0.2	Crowning [4]	0.5	68.1
Moderate-load Grass-Shrub (Gs2)	5.7	0.4	253	0.2	Crowning [4]	0.5	66.1
High-load Grasses (Gr7)	22.7	2.0	5,014	0.6	Crowning [4]	0.5	71.9
Scenario 2: 22% slope; Fall extreme offshore Wind from east (97th percentile)							
Moderate Load Grass-Shrub (Gs2)	10.7 (20.6)[6]	1.0 (4.3)	971 (4,080)	0.4 (1.4)	No	N/A	N/A
High Load Sagebrush scrub (Sh5)	26.3 (45.0)	2.1 (6.9)	6,914 (22,268)	0.8 (2.4)	No	N/A	N/A
Scenario 3: 16% slope; Fall extreme offshore Wind from southeast (97th percentile)							
Coast Live Oak Trees[2,3] (Sh4)	12.4 (23.8)[6]	1.0 (4.2)	1,357 (5,600)	0.5 (1.6)	Crowning [4]	1.1 (4.4)	119.9 (308.3)
High Load Sagebrush scrub (Sh5)	25.6 (44.6)	2.0 (6.8)	6,531 (21,884)	0.8 (2.4)	Crowning [4]	1.1 (4.4)	130.8 (336.4)
Scenario 4: 17% slope; Fall extreme offshore Wind from south (97th percentile)							
Moderate Load Grass-Shrub (Gs2)	12.4 (23.8)[6]	1.0 (4.2)	1,347 (5,590)	0.5 (1.6)	No	N/A	N/A
High Load Sagebrush scrub (Sh5)	25.5 (44.6)	2.0 (6.7)	6,486 (21,840)	0.8 (2.4)	No	N/A	N/A
Scenario 5: 9% slope; Summer Onshore Wind from west/southwest (50th percentile)							
Moderate-load Grasses (gr4)	10.7	1.4	978	0.4	No	N/A	N/A
High-load Grasses (gr7)	22.6	2.0	5,002	0.6	No	N/A	N/A
Moderate-load Grass-Shrub (Gs2)	5.7	0.4	252	0.2	No	N/A	N/A
Moderate-load sagebrush scrub (Sh2)	3.6	0.1	93	0.2	No	N/A	N/A

Note:

1. Wind-driven surface fire.
2. Coast live oak tree understory torching increases fire intensity. Modeling included canopy fuel over Sh4, which represents surface fuels beneath the tree canopies.
3. A surface fire in the mixed coast live oak forest would transition into the tree canopies generating flame lengths higher than the average tree height (25 feet). Viable airborne embers could be carried downwind for approximately 0.7 miles and ignite receptive fuels.
4. Crowning= fire is spreading through the overstory crowns.
5. MPH=miles per hour

Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph

Table 3. RAWS BehavePlus Fire Behavior Modeling Results – Post Project Conditions

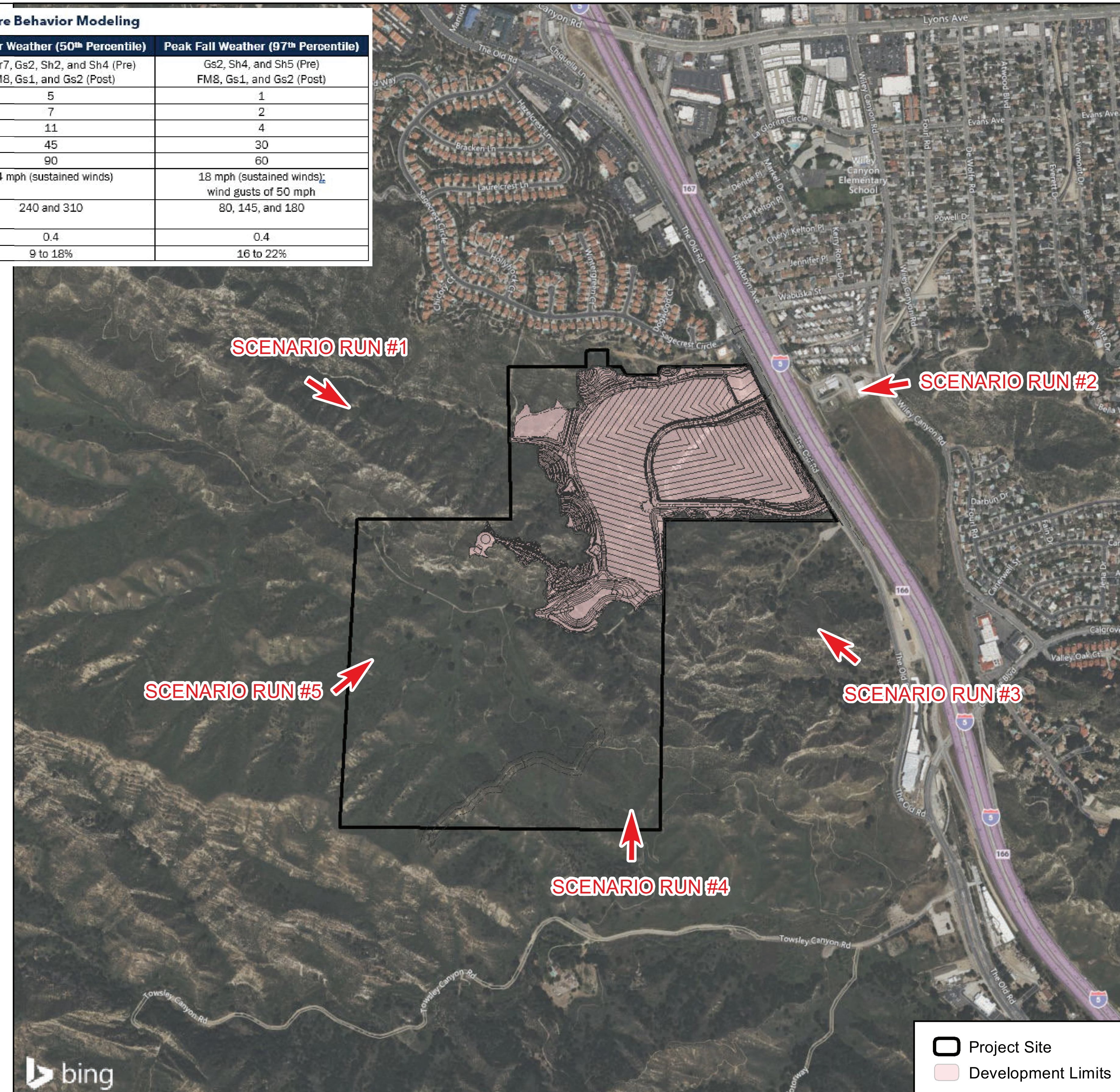
Fire Scenario	Flame Length[1] (feet)	Spread Rate[1] (MPH)[2]	Fireline Intensity (Btu/ft./sec.)	Spot Fire (miles)[3]
Scenario 1: 18% slope; Summer Onshore Wind from northwest (50th percentile)				
FMZ Zone A (FM8)	1.2	0.0	9	0.1
FMZ Zone B (Gs1)	4.0	0.3	113	0.2
FMZ Zone C (Gs2)	5.7	0.4	253	0.2
Scenario 2: 22% slope; Fall extreme offshore Wind from east (97th percentile)				
FMZ Zone A (FM8)	2.1 (3.0)[3]	0.1 (0.2)	28 (63)	0.1 (0.4)
FMZ Zone B (Gs1)	7.4 (14.0)	0.7 (3.0)	434 (1,763)	0.3 (1.1)
Scenario 3: 16% slope; Fall extreme offshore Wind from southeast (97th percentile)				
FMZ Zone A (FM8)	2.0 (3.0)	0.1 (0.2)	26 (63)	0.1 (0.4)
FMZ Zone B (Gs1)	7.2 (14.0)	0.7 (3.0)	409 (1,763)	0.3 (1.1)
FMZ Zone C (Gs2)	10.4 (20.5)	1.0 (4.2)	914 (4,022)	0.4 (1.4)
Scenario 4: 17% slope; Fall extreme offshore Wind from south (97th percentile)				
FMZ Zone A (FM8)	2.0 (3.0)	0.1 (0.2)	26 (63)	0.1 (0.4)
FMZ Zone B (Gs1)	7.1 (14.0)	0.7 (3.0)	406 (1,763)	0.3 (1.1)
FMZ Zone C (Gs2)	10.3 (20.5)	0.9 (4.2)	907 (4,015)	0.4 (1.4)
Scenario 5: 9% slope; Summer Onshore Wind from west/southwest (50th percentile)				
FMZ Zone A (FM8)	1.2	0.0	9	0.1
FMZ Zone B (Gs1)	4.0	0.3	113	0.2
FMZ Zone C (Gs2)	5.7	0.4	252	0.2

Note:

1. Wind-driven surface fire.
2. MPH=miles per hour
3. Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph

Table 1. Variables Used for Fire Behavior Modeling

Model Variable	Summer Weather (50th Percentile)	Peak Fall Weather (97th Percentile)
Fuel Models	Gr4, Gr7, Gs2, Sh2, and Sh4 (Pre) FM8, Gs1, and Gs2 (Post)	Gs2, Sh4, and Sh5 (Pre) FM8, Gs1, and Gs2 (Post)
1 h fuel moisture	5	1
10 h fuel moisture	7	2
100 h fuel moisture	11	4
Live herbaceous moisture	45	30
Live woody moisture	90	60
20 ft. wind speed	14 mph (sustained winds)	18 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	240 and 310	80, 145, and 180
Wind adjustment factor	0.4	0.4
Slope (uphill)	9 to 18%	16 to 22%



Path: Z:\Projects\j1279300\MAPDOC\DOCUMENT\Fire Assessment\Fig 8 BehavePlusAnalysisMap.mxd

SOURCE: AERIAL-BING MAPPING SERVICE

DUDEK

0 1,000 2,000 Feet

FIGURE 8

BehavePlus Analysis Map

Fire Protection Plan for the Trails at Lyons Canyon Project

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4 Emergency Response Service

The following sections analyze the Project in terms of current LACoFD Fire Service capabilities and resources to provide Fire Protection and Emergency Services. The analysis that follows examines the ability of the existing LACoFD fire stations to adequately serve the Project site in addition to the existing development within the service area. Response times were evaluated using Project build-out conditions. It was assumed that phased construction would include access roads to the newly constructed buildings and that the shortest access route to those structures would be utilized.

4.1 Emergency Response Fire Facilities

The Project is located within the LACoFD jurisdictional response area. Regionally, LACoFD provides fire, emergency medical, and rescue services from 173 stations. The Department serves over 4 million residents throughout 59 cities and all unincorporated portions of Los Angeles County. The Project site lies within the Northern Operations Bureau, Division 3. Fire Station 124 would provide an initial response; however, Stations 73 and 126 are available to provide a secondary response to the Project, if needed. These three existing stations were analyzed herein due to their proximity to the Project site. Figure 9 illustrates the station locations and Table 6 provides a summary of the LACoFD fire and medical delivery system for Fire Stations 124, 73 and 126.

Table 6. Closest LACoFD Responding Stations Summary

Station	Location	Equipment	Staffing
Station 124	25870 Hemingway Ave, Stevenson Ranch	Engine, Squad	3 person Engine 2 person Squad
Station 73	24875 Railroad Ave, Santa Clarita	Engine, Squad	3 person Engine 2 person Squad
Station 126	26320 Citrus St, Santa Clarita	Engine, Quint	3 person Engine 2 person Quint
Station 76	27223 Henry Mayo Dr, Valencia	Engine	3 person Engine

Source: Los Angeles County Fire Museum 2021

The closest existing fire station to the Trails at Lyons Canyon development is Station 124 located at 25870 Hemingway Ave, Stevenson Ranch, California, which includes a three (3)-person Engine Company and a two (2)-person Paramedic Squad Truck 24-hours per day/seven days a week. Additionally, Station 73 located at 24875 Railroad Ave, Santa Clarita, California would likely provide a secondary response. Station 126 located at 26320 Citrus St, Santa Clarita, California, and Station 76 located at 27223 Henry Mayo Dr, Valencia, California, could also provide additional response to the Lyons Canyon Project.

Within the area's emergency services system, fire and emergency medical services are also provided by other agencies. Generally, each agency is responsible for structural fire protection and wildland fire protection within their area of responsibility. However, mutual aid agreements enable non-lead fire agencies to respond to fire emergencies outside their district boundaries. In the Project area, fire agencies cooperate under a statewide master mutual aid agreement for wildland fires. There are also mutual aid agreements in place with neighboring fire agencies and typically include interdependencies that exist among the region's fire protection agencies for structural and medical responses but are primarily associated with the peripheral “edges” of each agency’s boundary.

4.1.1 Emergency Response Travel Time Coverage

Land use in the Stevenson Ranch/Santa Clarita Valley vicinity area varies greatly from urbanized and suburban clusters to vast rural areas. LACoFD’s response time targets by land-use type are:

- 5 minutes or less for urban areas
- 8 minutes or less for suburban areas
- 12 minutes or less for rural areas

In an effort to understand fire department response capabilities, Dudek conducted an analysis of the travel-time response coverage from the closest, existing station (Fire Station 124). The response time analysis was conducted using travel distances that were derived from Google road data and Project development plan data. Travel times were calculated applying the distance at speed limit formula (T=(D/S) * 60, where T=time, D=distance in miles, and S=speed in MPH) as well as the nationally recognized Insurance Services Office (ISO) Public Protection Classification Program’s Response Time Standard formula (T=0.65 + 1.7 D, where T= time and D = distance) for comparison. The ISO response travel time formula discounts speed for intersections, vehicle deceleration, and acceleration, and does not include turnout time. Tables 7 presents tabular results of the emergency response time analysis using the distance at speed formula and the ISO formula, respectively.

Table 7. Project Emergency Response Analysis using Speed Limit Formula

Station	Travel Distance to Project Entrance	Travel Time to Project Entrance[1]	Maximum Travel Distance[2]	Maximum Travel Time	Total Response Time[3]
Station 124	2.6 miles	4 minutes 30 seconds	3.1 miles	5 minutes 19 seconds	7 minutes 19 seconds
Station 73	3.5 miles	6 minutes 0 seconds	4.0 miles	6 minutes 52 seconds	8 minutes 52 seconds
Station 126	4.6 miles	7 minutes 54 seconds	5.1 miles	8 minutes 44 seconds	10 minutes 44 seconds
Station 76	6.2 miles	10 minutes 38 seconds	6.7 miles	11 minutes 29 seconds	13 minutes 29 seconds

Notes:

1. Assumes travel distance and time to the Project entrance off The Old Road from fire station, and application of the distance at speed limit formula (T=(D/S) * 60, where T=time, D=distance in miles, and S=speed in MPH), a 35 mph travel speed, and does not include turnout time.
2. Assumes travel distance and time to the furthest point within the Project site from fire station, and application of the distance at speed limit formula (T=(D/S) * 60, where T=time, D=distance in miles, and S=speed in MPH), a 35 mph travel speed, and does not include turnout time.
3. Emergency response time target thresholds include travel time to furthest point within the Project site from fire station, and application of the distance at speed limit formula (T=(D/S) * 60, where T=time, D=distance in miles, and S=speed in MPH) a 35 mph travel speed along with dispatch and turnout time, which can add an additional two minutes to travel time.

Table 8. Project Emergency Response Analysis using ISO Formula

Station	Travel Distance to Project Entrance	Travel Time to Project Entrance[1]	Maximum Travel Distance[2]	Maximum Travel Time	Total Response Time[3]
Station 124	2.6 miles	5 minutes 4 seconds	3.1 miles	5 minutes 55 seconds	7 minutes 55 seconds
Station 73	3.5 miles	6 minutes 36 seconds	4.0 miles	7 minutes 27 seconds	9 minutes 27 seconds
Station 126	4.6 miles	8 minutes 28 seconds	5.1 miles	9 minutes 19 seconds	11 minutes 19 seconds
Station 76	6.2 miles	11 minutes 11 seconds	6.7 miles	12 minutes 2 seconds	14 minutes 2 seconds

Notes:

1. Assumes travel distance and time to the Project entrance off The Old Road from fire station, and application of the ISO formula, T=0.65+1.7(Distance), a 35 mph travel speed, and does not include turnout time.
2. Assumes travel distance and time to the furthest point within the Project site from fire station, and application of the ISO formula, T=0.65+1.7(Distance), a 35 mph travel speed, and does not include turnout time.
3. Emergency response time target thresholds include travel time to furthest point within the Project site from fire station, and application of the ISO formula, T=0.65+1.7(Distance), a 35 mph travel speed along with dispatch and turnout time, which can add an additional two minutes to travel time.

Emergency response time target thresholds include travel time along with dispatch and turnout time, which can add two minutes to travel time. LACoFD Fire Station 124 would provide an initial response as the closest existing fire station. As indicated in Table 7 and Table 8, the total response time from Station 124 to the Lyons Canyon Project site entrance conforms to the response time standard of eight (8) minutes for suburban areas, estimated to arrive within approximately 7 minutes and 19 seconds (Speed Limit Formula) or 7 minutes 55 seconds (ISO Formula). The second engine to the Project site is estimated to arrive within approximately 8 minutes and 52 seconds (Speed Limit Formula) or 9 minutes and 27 seconds (ISO Formula). All response calculations are based on an average response speed of 35 mph, consistent with nationally recognized National Fire Protection Association (NFPA) 1710. Based on these calculations, the Project would meet or substantially conform with the County's response time standard for "suburban areas" from existing fire stations.

4.2 Estimated Calls and Demand for Service

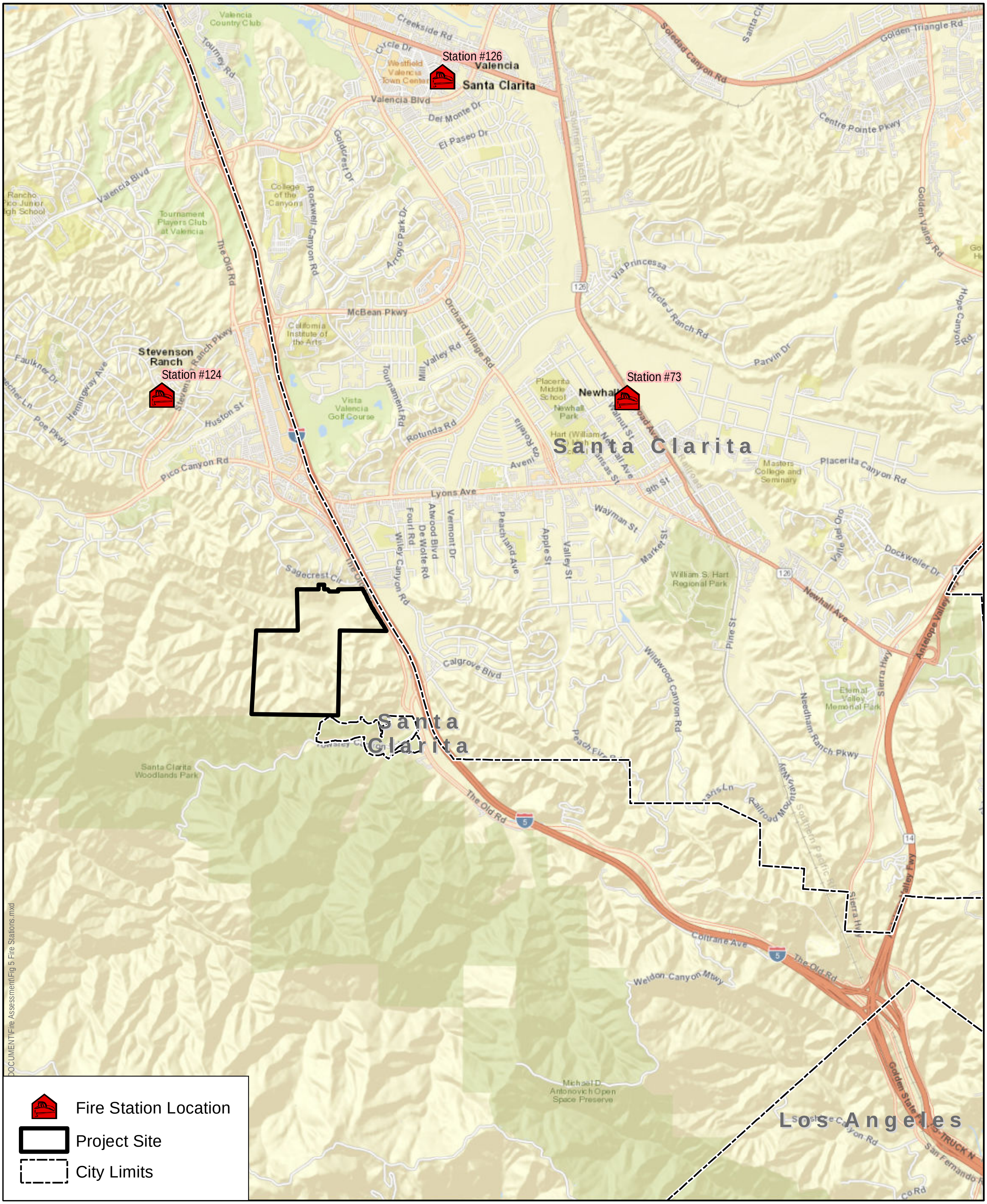
Emergency call volumes related to typical projects, such as new residential developments, can be reliably estimated based on the historical per-capita call volume from a particular fire jurisdiction. The LACoFD documented 379,517 total incidents for 2020 generated by a County-wide service area total population of approximately 4,067,549 persons in 58 cities and all unincorporated communities within Los Angeles County. The County's per capita annual call volume is approximately 93 calls per 1,000 persons. The resulting per capita call volume is 0.093 (LACoFD 2021).

The estimated incident call volume at Project buildout is based on a conservative estimate of the maximum potential number of persons on-site at any given time (considered a "worst-case" scenario). The Project includes 510 residential units, which includes a mix of attached and detached dwelling units, and affordable senior housing. Using Los Angeles County Fire agencies' estimate per capita call volume of 0.093 (93 annual calls per 1,000 population), the Trails at Lyons Canyon Project's estimated 1,520 residents would generate up to 142 additional calls per year (12 calls per month). The type of calls expected would primarily be medical-related.

4.2.1 Response Capability Impact Assessment

The available firefighting and emergency medical resources in the vicinity of the Project site include an assortment of fire apparatus and equipment considered fully capable of responding to the type of fires and emergency medical calls potentially occurring within the Project site. In 2020 Station 124, the primary responding station for the Project, responded to a total of 2,296 incidents with an approximate call volume of 6 calls a day (LACoFD 2021).

The Trails at Lyons Canyon Project includes 510 new residential dwelling units. The Trails at Lyons Canyon development is conservatively projected to add up to 142 calls per year (approximately 12 calls per month or less than one call a day), mostly medical, initially within Station 124's first-in response jurisdiction. The addition of 142 calls per year is not considered a significant impact given Station 124's annual call volume of 2,296 calls per year, raising the average number of daily calls from 6.3 to 6.7. For context, a busy suburban fire station would run 12 or more calls per day. An average station runs about seven calls per day (Hunt 2007). The level of service demand for the Trails at Lyons Canyon Project site slightly raises overall call volume but is not anticipated to impact the existing fire station to a point that they cannot meet the demand. Station 124 would respond to an additional 142 calls per year (approximately 12 calls per month or less than one call a day), although the number will likely be lower than that based on the conservative nature of the population and calls per capita data used in this estimate. Final determination of the potential impact on the existing emergency response delivery system will be made by the LACoFD.



SOURCE: ESRI MAPPING SERVICE; LOS ANGELES COUNTY GIS

FIGURE 9
LA County Fire Department Battalions and Stations Map
Fire Protection Plan for the Trails at Lyons Canyon Project

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5 Buildings, Infrastructure and Defensible Space

This FPP demonstrates that the Project would comply with applicable portions of the 2020 Los Angeles Fire Code (Title 32), as amended, and adopted by reference the 2019 edition of the CFC. The Project also complies with Chapter 7A of the 2019 California Building Code (CBC); the 2019 California Residential Code, Section 237; and 2018 Edition of the International Fire Code as adopted by the County. The Project would also be subject to the provisions of section 4291 of the Public Resources Code regarding brush clearance standards around structures and the Los Angeles County Fire Department guidelines for Fuel Modification Plans. The Project will meet or exceed applicable codes or will provide alternative materials and/or methods. While these standards will provide a high level of protection to structures for the Project, there is no guarantee that compliance with these standards will prevent damage or destruction of structures by fire in all cases. A response map update, including roads and fire hydrant locations, in a format compatible with current department mapping, shall be provided to the LAcoFD.

The following summaries highlight important fire protection features. All underground utilities, hydrants, water mains, curbs, gutters, and sidewalks will be installed, and the drive surface shall be approved prior to combustibles being brought on site.

5.1 Fire Apparatus Access

5.1.1 Access Roads

The Project would involve the construction of new structures, roadways, and would generate new trips to and from the Project site. Project site access, including road widths and connectivity, will be consistent with the County's roadway standards and the 2019 CFC Section 503. Additionally, an adequate water supply and approved paved access roadways shall be installed prior to any combustibles being brought on-site and will include:

- The primary and secondary access to the Project is provided via The Old Road, which satisfies secondary access requirements detailed in Title 21, Section 21.24 – Design Standards, Part 1– Access of the Los Angeles County Code of Ordinances.

- Internal circulation is comprised of a loop roadway system that connects both the primary and secondary access points along the Old Road. All interior circulation roads include all roadways that are considered common or primary roadways for traffic flow through the Project site and for fire department access serving all proposed residential lots. Any dead-end streets serving new residential structures that are longer than 150 feet will have approved provisions for fire apparatus turnaround.

- Fire apparatus access roads for commercial, industrial, and multifamily-residential developments shall be installed and arranged in accordance with Sections 503.2.1.2.1 through 503.2.1.2.2.2. For purposes of this section, the highest roof surface shall be determined by measurement of the vertical distance between the access roadway and the eave of a pitched roof, the intersection of the roof to the exterior wall, or the top of parapet walls, whichever is greater. 503.2.1.2.1. Where the highest roof surface does not exceed 30 feet. For buildings where the vertical distance between the access roadway and the highest roof surface does not exceed 30 feet (9144 mm), fire apparatus access roads shall have an unobstructed width of not less than 26 feet (7925 mm), exclusive of shoulders, and an unobstructed clearance of clear to the sky.

- Private and public streets for each phase shall meet all Project approved fire code requirements and/or mitigated exceptions for maximum allowable dead-end distance, paving, and fuel management before combustibles being brought to the site.
- Fire access roadways that allow parking shall provide a minimum clear width of not less than 34 feet for parking on one side and a clear width of not less than 42 feet for parking on both sides. The interior residential access roads will be designed to accommodate a minimum of a 75,000-pound (lb.) fire apparatus load.

- All interior circulation roads include all roadways that are considered common or primary roadways for traffic flow through the Project site and fire department access serving all proposed residential lots.
- Fire apparatus roads shall have an unobstructed width of not less than 20 feet, exclusive of shoulders, except for approved security gates per Section 503.6, a minimum turning radius of 32 feet, and an unobstructed vertical clearance clear to the sky to allow aerial ladder truck operation. Where a fire hydrant is located along a fire apparatus road, the road shall be constructed to a minimum unobstructed road width of 26 feet, exclusive of shoulders.
- Roads with a median or center divider will have a minimum 20 feet unobstructed width on both sides of the center median or divider.
- Roadways and/or driveways will provide fire department access within 150 feet of all portions of the exterior walls of the first floor of each structure.
- Access roads shall be completed and paved prior to the issuance of building permits and prior to the occurrence of combustible construction.
- The developer will provide information illustrating the new roads, in a format acceptable to the LACoFD for updating of Fire Department response maps.
- Traffic calming devices such as speed bumps, speed humps, etc. shall be prohibited unless approved by LACoFD.

5.1.2 Gates

Gates shall be in compliance with 2020 County of Los Angeles Fire Code Section 503.6 Gates. The installation of security gates across a fire apparatus access road shall be approved by the fire code official. Where security gates are installed, they shall have an approved means of emergency operation.

Gates securing the fire apparatus access roads shall comply with all of the following criteria:

1. Where a single gate is provided, the gate width shall not be less than 20 feet (6096 mm), except on a fire apparatus access roadway approved to be a lesser width, in which case the gate shall not restrict that width. Where a fire apparatus road consists of a divided roadway, the gate width shall not less than 15 feet (4572 mm) for residential use and 20 feet (6096 mm) for commercial/industrial uses.

2. Gates shall be of the swinging of sliding type.
3. Construction of gates shall be of materials that allow manual operation by one person.
4. Gate components shall be maintained in an operative condition at all times and replaced or repaired when defective.
5. Electric gates shall be equipped with a means of opening the gate by fire department personnel for emergency access. Emergency opening devices shall be approved by the fire code official.
6. Methods of locking shall be submitted for approval by the fire code official.
7. Electric gate operators, where provided, shall be listed in accordance with UL 325.
8. Gates intended for automatic operation shall be designed, constructed and installed to comply with the requirements of ASTM F2200.

5.1.3 Road Width and Circulation

Internal circulation would be from a series of internal streets that loop back to the primary and secondary access points along The Old Road. On-site roads will be constructed to current Los Angeles County Fire Apparatus Access Code standards and 2019 CFC, including all interior fire access roadways where a fire hydrant is located, shall be constructed to a minimum unobstructed road width of 26 feet, exclusive of shoulders and shall be improved with aggregate cement or asphalt paving materials. Fire apparatus roads where a hydrant is not located shall have a minimum unobstructed width of not less than 20 feet, exclusive of shoulders, except for approved security gates in accordance with Section 503.6, a minimum turning radius of 32 feet, and an unobstructed vertical clearance clear to the sky to allow aerial ladder truck operation. A minimum vertical clearance of 13 feet 6 inches may be allowed for protected tree species adjacent to access roads. Any applicable tree-trimming permit from the appropriate agency is required.

Fire apparatus access roads for commercial, industrial, and multifamily-residential developments shall be installed and arranged in accordance with Sections 503.2.1.2.1 through 503.2.1.2.2.2. For purposes of this section, the highest roof surface shall be determined by measurement of the vertical distance between the access roadway and the eave of a pitched roof, the intersection of the roof to the exterior wall, or the top of parapet walls, whichever is greater. 503.2.1.2.1. Where the highest roof surface does not exceed 30 feet. For buildings where the vertical distance between the access roadway and the highest roof surface does not exceed 30 feet (9144 mm), fire apparatus access roads shall have an unobstructed width of not less than 26 feet (7925 mm), exclusive of shoulders, and an unobstructed clearance of clear to the sky. Fire access roadways designed to allow parking shall provide a minimum clear width of not less than 34 feet for parking on one side and a clear width of not less than 42 feet for parking on both sides. The interior residential access roads will be designed to accommodate a minimum of a 75,000-pound (lb.) fire apparatus load.

5.1.4 Dead-End Roads

2020 County of Los Angeles Fire Code Section 503.2.5. Dead ends. Dead-end fire apparatus access roads in excess of 150 feet (45,720 mm) shall be provided with an approved turnaround. The turnaround should be oriented on the access roadway in the proper direction of travel. As depicted in Figure 3, Lots 8, 9 and 10 requires a LACoFD turnaround in accordance with Figure 503.2.5(2) of the 2020 County of Los Angeles Fire Code, Section 503.2.5.

5.1.5 Grade

The Project complies with the Los Angeles County grade requirements. Fire apparatus access roads shall not exceed 15 percent in grade.

5.1.6 Surface

All fire apparatus access and vehicle roadways shall be asphalt or concrete and designed and constructed in accordance with County Public Works standards and be designed to accommodate a minimum of a 75,000-pound fire apparatus load.

5.1.7 Vertical Clearance

- Fire apparatus access roads shall have an unobstructed width of not less than 20 feet no less than 26-feet where hydrants are provided, exclusive of shoulders, and except for approved security gates in accordance with Section 503.6, and an unobstructed vertical clearance clear to the sky to allow aerial ladder truck operation. Exception: A minimum vertical clearance of 13 feet 6 inches may be allowed for protected tree species adjacent to access roads. Any applicable tree-trimming permit from the appropriate agency is required.

5.1.8 Premise Identification

Identification of roads and structures will comply with Fire Code as follows:

- All residential structures shall be identified by street address. Numbers shall be 4 inches in height, 1/2 -inch stroke, and located 6 to 8 feet above grade. Addresses on multi-residential buildings shall be 6 inches high with a 1/2-inch stroke. Numbers will contrast with the background.
- Multiple structures located off common driveways or roadways will include posting addresses on structures and the entrance to individual driveway/roads or at the entrance to the common driveway/ road for faster emergency response.
- Streets will have street names posted on non-combustible street signposts. Letters/numbers will be per County standards.

Premise identification will be installed, street signs and building numbers, prior to the occupancy of structures.

5.1.9 Ignition Resistant Construction and Fire Protection

The proposed structures throughout the Project will be built utilizing the most current construction methods intended to mitigate wildfire exposure, required by LACoFD, at the time of construction. Within the limits established by law, construction methods intended to mitigate wildfire exposure will comply with the wildfire protection building construction requirements contained in the Los Angeles County Building Code including the following:

4. Los Angeles County Building Code, Chapter 7A
5. Los Angeles County Residential Code, Section R327
6. Los Angeles County Referenced Standards Code, Chapter 12-7A

Construction practices respond to the requirements of the LACoFD Fire Code Title 32 and the Los Angeles County Building Code (Title 26, Chapter 7A), "Construction Methods for Exterior Wildfire Exposure" These requirements include the ignition resistant requirements found in Chapter 12-7A of the Los Angeles County Referenced Standards Code. While these standards will provide a high level of protection to structures in this development and should reduce or eliminate the need to order evacuations, there is no guarantee of assurance that compliance with these standards will prevent damage or destruction of structures by fire in all cases.

There are two primary concerns for structure ignition: 1) radiant and/or convective heat and 2) burning embers (NFPA 1144 2008, Ventura County Fire Protection District 2011, IBHS 2008, and others). Burning embers have been a focus of building code updates for at least the last decade, and new structures in the Wildland Urban Interface (WUI) built to these codes have proven to be very ignition resistant. Likewise, radiant and convective heat impacts on structures have been minimized through the Chapter 7A exterior fire ratings for walls, windows and doors. Additionally, provisions for modified fuel areas separating wildland fuels from structures have reduced the number of fuel-related structure losses. As such, most of the primary components of the layered fire protection system provided the project are required by the LACoFD, but are worth listing because they have been proven effective for minimizing structural vulnerability to wildfire and, with the inclusion of required interior sprinklers, of extinguishing interior fires, should embers succeed in entering a structure. Even though these measures are now required by the latest Building and Fire Codes, at one time, they were used as mitigation measures for buildings in WUI areas, because they were known to reduce structure vulnerability to wildfire. These measures performed so well, they were adopted into the code. The following project features are required for new development in WUI areas and form the basis of the system of protection necessary to minimize structural ignitions as well as providing adequate access by emergency responders:

1. The 7A Materials and Construction Methods for Exterior Wildfire Exposure (CBC) chapter details the ignition resistant requirements for the following key components of building safely in wildland urban interface and fire hazard severity zones:

    a. Roofing Assemblies (covering, valleys and gutters)
    b. Vents and Openings
    c. Exterior wall covering
    d. Open Roof Eaves
    e. Closed Roof Eaves and Soffits
    f. Exterior Porch Ceilings
    g. Floor projections and underfloor protection
    h. Underfloor appendices
    i. Windows, Skylights and Doors
    j. Decking
    k. Accessory structures

2. Class-A fire rated roof and associated assembly. With the proposed class-A fire rated roof, areas where there will be attic or void spaces requiring ventilation to the outside environment, the attic spaces will require either ember-resistant roof vents or a minimum 1/16-inch mesh (smaller sizes restrict air flow) and shall not exceed 1/8-inch mesh for side ventilation (recommend BrandGuard, O'Hagin or similar vents). All vents used for this project will be approved by LACoFD.

    Multi- pane glazing with a minimum of one tempered pane, fire-resistance rating of not less than 20 minutes when tested according to NFPA 257 (such as SaftiFirst, SuperLite 20-minute rated glass product), or be tested to meet the performance requirements of State Fire Marshal Standard 12-7A-2

3. Automatic, Interior Fire Sprinkler System to code by occupancy type for all habitable, residential dwellings (e.g., 13D for single family and 13R for multifamily dwelling units).

4. Modern infrastructure, access roads, and water delivery system.

5.2 Infrastructure and Fire Protection Systems Requirements

The following infrastructure components are made in order to comply with the Los Angeles County requirements, the 2019 California Fire Code, LACoFD's Fire Code Standards, and nationally accepted fire protection standards, as well as additional requirements to assist in providing reasonable on-site fire protection.

5.2.1 Water Supply

The Santa Clarita Valley Water Agency (SCVWA), or other public utility district (PUD), would be the water purveyor to provide domestic water supplies and fire flows to the Project. Approval from the California Public Utility Commission would be required prior to construction improvements to the water system. New water infrastructure would be required to provide service to the Project site. The water needs of Lyons Canyon will be met through various water resource management strategies and secure water sources throughout the buildout of the Project. Consistent with Government Code Section 66473.7, each proposed subdivision will have an available water supply that meets or exceeds Project demand under normal, single-dry, and multiple-dry year scenarios. This Water Service Plan will provide a flexible, reliable water supply throughout Project development without adversely affecting other local groundwater users or other users of critical SWP resources.

The Project will be consistent with County Title 20, Section 20.16.060 for fire flow and fire hydrant requirements within a VHFHSZ. The Project will provide a 2-million-gallon water tank in the southwest portion of the development area. The water tank includes a chemical feed building to its south. Project-internal waterlines will also supply sufficient fire flows and pressure to meet the demands for required onsite fire hydrants and interior fire sprinkler systems for all structures. Water supply must meet a 2-hour fire flow requirement of 2,500 gpm with 20-psi residual pressure, which must be over and above the daily maximum water requirements for this development. Water utilities will be connected prior to any construction.

5.2.2 Fire Hydrants

The fire hydrant requirements shall be incompliance with Appendix C in the 2020 County of Los Angeles Fire Code.

5.2.3 Automatic Fire Sprinkler Systems

All structures, of any occupancy type, will be protected by an automatic, interior fire sprinkler system. All structures automatic internal fire sprinklers would be in accordance with National Fire Protection Association (NFPA) 13, 13D, or 13R and LACoFD installation requirements as required based on structure type, use and size. Actual system design is subject to final building design and the occupancy types in the structure. Fire sprinkler plans for each structure will be submitted and reviewed by LACoFD for compliance with the applicable fire and life safety regulations, codes, and ordinances.

5.2.4 Residential Hazard Detectors

All residences will be equipped with residential smoke detectors and carbon monoxide detectors and comply with current CBC, CFC, and California Residential Code standards.

5.2.5 Ban on Wood-Burning Fireplaces

The Project's plans and specifications shall prohibit wood-burning fireplaces as required by SCAQMD Rule 445 in single-family residences throughout the entire Project site. These requirements shall be posted on the community intranet and shall be clearly described and distributed to home buyers through their home purchase contracts and CC&Rs.

5.3 Ongoing Building Infrastructure Maintenance

The Project's HOA(s) shall be responsible for long term funding and maintenance of private roads and fire protection systems, including fire sprinklers and private fire hydrants.

5.4 Pre-Construction Requirements

Per Los Angeles County Fire Code, 4908.1, a fuel modification plan shall be submitted and have preliminary approval prior to any subdivision of land; or, have final approval prior to the issuance of a permit for any permanent structure used for habitation; where, such structure, or subdivision is located within areas designated as a Fire Hazard Severity Zone within State Responsibility Areas or Very High Fire Hazard Severity Zone within the Local Responsibility areas, applicable Fire Hazard Zone maps, and Appendix P of this code at the time of application. An on-site inspection must be conducted by the personnel of the Forestry Division of the Fire Department and a final approval of the fuel modification plan issued by the Forestry Division prior to a certificate of occupancy being granted by the building code official.

Per CFC Section 501.3, construction documents for FD access and hydrant systems are to be submitted to the FD for approval prior to construction. Additionally, per CFC Section 501.4, access roads and water supply are to be installed prior to construction. As an additional consultant recommendation, prior to bringing lumber or combustible materials onto the Project site, improvements within the active development area shall be in place, including utilities, operable fire hydrants, an approved, and fuel modification zones established.

5.5 Activities in a Hazardous Fire Area

The Project will comply with LACoFD requirements for activities in Hazardous Fire Areas. It is recommended that a construction fire prevention plan (CFPP) be prepared for the Project prior to commencement of construction activities, which will designate fire safety measures to reduce the possibility of fires during the construction phase. The CFPP may include the following measures: fire watch/ fire guards during hot works and heavy machinery activities, requirements for temporary powerlines, hose lines attached to hydrants or a water tender, Red flag warning weather period restrictions, required onsite fire resources, and others as determined necessary.

The proposed structures will be built utilizing the most current construction methods intended to mitigate wildfire exposure, required by LACoFD, at the time of construction. Within the limits established by law, construction methods intended to mitigate wildfire exposure will comply with the wildfire protection building construction requirements contained in the Los Angeles County Building Code including the following:

9. Los Angeles County Building Code, Chapter 7A
4. Los Angeles County Residential Code, Section R327
5. Los Angeles County Referenced Standards Code, Chapter 12-7A

Construction practices respond to the requirements of the 2020 County of Los Angeles Fire Code and the Los Angeles County Building Code (Title 26, Chapter 7A), “Construction Methods for Exterior Wildfire Exposure” These requirements include the ignition resistant requirements found in Chapter 12-7A of the Los Angeles County Referenced Standards Code. While these standards will provide a high level of protection to structures in the development and should reduce or eliminate the need to order evacuations, there is no guarantee of assurance that compliance with these standards will prevent damage or destruction of structures by fire in all cases.

5.6 Defensible Space and Vegetation Management

5.6.1 Defensible Space and Fuel Modification Zone (FMZ) Requirements

An important component of a fire protection system for the Project is the provision for fire-resistant landscapes and modified vegetation buffers. FMZs are designed to provide vegetation buffers that gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones, restricted vegetation zones, and irrigated zones adjacent to each other on the perimeter of the WUI exposed structures.

Perimeter structures will be located adjacent to FMZ areas that separate the Project from naturally vegetated open space areas to the southern and western portions of the Project site. Based on the modeled extreme weather flame lengths for the Project site, wildfire flame lengths are projected to be approximately between 1.2 to 10.4 feet high in areas of Development Footprint-adjacent coastal scrub and chaparral fuels, and up to 20.5 feet with 50 mph peak gusts. The fire behavior modeling system used to predict these flame lengths was not intended to determine sufficient FMZ widths, but it does provide the average predicted length of the flames, which is a key element for determining “defensible space” distances for providing firefighters with room to work and minimizing structure ignition. For the Lyons Canyon Project site, the 200 feet wide FMZs include between 54 and 200 feet onsite , which is approximately 7 times the modeled flame lengths based on the fuel type represented adjacent to the Development Footprint. The FMZ, which are largely accommodated onsite, will be constructed from the structure outwards towards undeveloped areas.

Figure 10 illustrates the FMZ Plan proposed for the Lyons Canyon Project Site, including a minimum 30-foot wide irrigated, setback area Zone A, a minimum 70-foot wide irrigated area Zone B, and a 100-foot wide thinning area Zone C. Additionally, there are Zone A equivalent areas, which include hardscape and landscape that provides equivalent function as a typical Zone A. The Zone A equivalent areas typically include roads, sidewalks and related landscape within the developed portions of the property. Because 16 lots along the eastern boundary in the southwestern Portion of the Project rely on substantial off-site FMZ, there will be enhanced construction features, such as a 6-foot heat deflecting wall constructed of concrete masonry units (CMUs) between on-site structures and unmaintained open space.

Although FMZs are very important for setting back structures from adjacent unmaintained fuels, the highest concern is considered to be from firebrands or embers as a principal ignition factor. To that end, the Project site, based on its location and ember potential, is required to include the latest ignition and ember resistant construction materials and methods for roof assemblies, walls, vents, windows, and appendages, as mandated by the LACoFD and County’s Fire and Building Codes (e.g., Chapter 7A). For example, roofs are required to be Class A fire rated systems, vents are required to include narrow wire mesh or ember-resistant baffles, and windows are required to include two panes with one of the panes tempered for strength. These and other required exterior fire hardening methods result in structures that can withstand significant wildfire, as demonstrated by the California State Fire Marshal's Office post-fire damage and loss statistics which indicate that, on average, for the nine worst property-loss fires dating back to 2017, approximately 1% of the homes and apartments destroyed, damaged, or affected were new dwellings (built after January 2010) even though new dwellings make up roughly 7% of the state's total housing stock (Office of the State Fire Marshal 2023).

Los Angeles County Fuel Modification Zone Standards

An FMZ is a strip of land where combustible vegetation has been removed and/or modified and partially or completely replaced with more adequately spaced, drought-tolerant, fire-resistant plants in order to provide a reasonable level of protection to structures from wildland fire. The purpose of the section is to document LACoFD's standards and make them available for reference. However, we are proposing a site-specific fuel modification zone program with additional measures that are consistent with the intent of the standards. Los Angeles County Fire Code (Title 32, Fire, Section 4908) is consistent with the 2019 California Fire Code (Section 4907 — Defensible Space), Government Code 51175 – 51189, and Public Resources Code 4291, which require that fuel modification zones be provided around every building that is designed primarily for human habitation or use within a VHFHSZ.

According to LACoFD's Fuel Modification Unit. a typical landscape/fuel modification installation consists of a 30-foot-wide Zone A, a 70-foot wide Zone B, and a 100-foot wide Zone C for a total of 200 feet width. As described above, the Project-specific FMZ will be consistent with this requirement, and will include off-site FMZ in some areas, as presented in Figure 10. The Project's chemical feed building will include 100 feet of FMZ, per Figure 10. A Fuel Modification Plan shall be reviewed and approved by the Forestry Division of the LACoFD for consistency with defensible space and fire safety guidelines.

To ensure long-term identification and maintenance, a fuel modification area shall be identified by a permanent zone marker meeting the approval of LACoFD. All markers will be located along the perimeter of the fuel modification area at a minimum of 500 feet apart or at any direction change of the fuel modification zone boundary. FMZs will be maintained on at least an annual basis or more often as needed to maintain the fuel modification buffer function.

An on-site inspection will be conducted by staff of the Forestry Division of the LACoFD upon completion of landscape install before a certificate of occupancy being granted by the County's building code official.

Project Fuel Modification Zone Treatments

Zone A: Setback Zone – from structure outward to minimum 30 feet

Irrigation by automatic or manual systems shall be provided to landscaping to maintain healthy vegetation.

1. Irrigated by the automatic or manual system to maintain healthy vegetation and fire resistance
2. Landscaping and vegetation in this zone shall consist primarily of green lawns, ground covers (not exceeding 6 inches in height), and spaced shrubs.
3. Zone A should be planted with plants from Appendix D: Acceptable Plant List by Fuel Modification Zone. Plant selection for Zone A should consist of small herbaceous or succulent plants less than two to three feet in height or regularly irrigated and mowed lawns.
4. Trees are not recommended for Zone A unless they are dwarf varieties or mature trees of small stature.
5. Prohibited plant species (Appendix D-2) shall not be within 30 feet or more of the structures.

6. Vines and climbing plants shall not be allowed on any structure.
7. In all cases, the overall characteristics of the landscape provide adequate defensible space in a fire environment.

Zone B: Irrigated Zone – minimum 70 feet from the outer edge of Zone A

Automatic or manual irrigation systems are required for this zone unless it consists entirely of native plants.

1. Zone B plant selection should consist primarily of irrigated green lawns, ground covers not exceeding six inches in height (except as approved by LACoFD), and adequately spaced shrubs.

2. Ground covers shall be maintained to not exceed 6 inches. If they are located on a lope 12-inches is acceptable within 50-feet of structures and 18 inches beyond 50 feet.

3. Annual grasses and weeds shall not exceed a height of 3 inches.

4. Vegetation may consist of modified existing native plants, adequately spaced ornamental shrubs trees, or both.

5. Target species (Appendix D-2) are not allowed within 30 feet or more of combustible structures and may require removal if existing on-site. If necessary, the distance may be extended to 50-feet.

6. Irrigation shall be provided to maintain healthy vegetation by automatic or manual systems. If this zone consists entirely of native plants, then irrigation systems are not required.

8. Trees found in Appendix D-1 can be planted, if they are Zone B appropriate, far enough from structures, spaced approximately, and do not overhang any structures at maturity.
9. In all cases, the overall characteristics of the landscape provide adequate defensible space in a fire environment.

1. **Zone C: Native Brush Thinning Zone** –100 feet from the outer edge of Zone B Irrigation systems are not required if the zone entirely consists of native plants.

2. Vegetation may consist of modified existing native plants, adequately spaced ornamental shrubs, trees, or both.

3. In all cases, the overall characteristics of the landscape provide adequate defensible space in a fire environment.

4. Plants in Zone C shall be spaced appropriately, and existing native vegetation shall be modified by thinning and removal of species constituting fire risks such as but not limited to chamise, sage, sagebrush, and buckwheat.

5. Annual grasses and weeds shall not exceed a height of 3 inches.

6. General spacing for existing native shrubs or groups is 15 feet between canopies. Native plants may be thinned by reducing the amounts as the distance from the development increases.

7. General spacing for existing native trees or groups of trees is 30-feet between canopies. This may be increased or decreased depending on the slope, arrangement of trees, and the species of the trees.

Zone C is considered a thinning zone. When provided, either by conditions of development, voluntary by the property owner, or required by the LACoFD, this zone is more of a progressive thinning zone to lessen the spread of fire as it approaches the primary FMZ adjacent to structures. The amount of fuel reduction and removal should take into consideration the type and density of fuels, aspect, topography, weather patterns, and fire history.

Fire Access Road Zone

Approved plan description: Extends a minimum of 10 feet from the edge of any public or private roadway that may be used as access for fire-fighting apparatus or resources. Clear and remove flammable growth for a minimum of 10 feet on each side of the access roads. (Fire Code 325.10) Additional clearance beyond 10 feet may be required upon inspection. Required on all areas of Project. The water tank access road will include roadside FMZ, as achievable based on grading requirements, per the Project's Fuel Modification Plan.

1. Required clearance extends a minimum of 10 feet from the edge of any public or private roadway as well as an unobstructed vertical clearance to the sky.

2. Landscaping and native plants shall be appropriately spaced and maintained.

3. Trees found in Appendix D-1 can be planted, if they are far enough from structures and Fire Department accesses, and do not overhang any structures or access at maturity.

Roadside fuel modification for the Project consists of maintaining ornamental landscapes, including trees, clear of dead and dying plant materials. Roadside fuel modification shall be maintained by the Project's HOA.

Roadway Clearance

Per section 325.10 of the County Fire Code, LACoFD may require additional removal and clearance of flammable vegetation or combustible growth along roadsides. Vegetation clearance would be a minimum of 10-feet on each side of the roadway whether public or private road. The minimum clearance of 10-feet may be increased if the fire code official determines additional distance is required to provide reasonable fire safety.

Special Fuel Management Issues

On the Project site, tree planting in the fuel modification zones and along roadways is acceptable, as long as they meet the following restrictions as described below and in the County's Fire Code and the LACoFD's Guide to Defensible Space and Fuel Modification Zones spacing requirements:

- For streetscape plantings, trees should be planted 10 feet from the edge of the curb to the center of the tree trunk. Care should be given to the type of tree selected, that it will not encroach into the roadway, or produce a closed canopy effect.

- Crowns of trees located within defensible space shall maintain a minimum horizontal clearance of 15 feet for a single tree. Mature trees shall be pruned to remove limbs one-third the height of six feet, whichever is less, above the ground surface adjacent to the trees.
- Deadwood and litter shall be regularly removed from trees.
- Ornamental trees shall be limited to groupings of 2–3 trees with canopies for each grouping separated horizontally.
- The provided water tank chemical feed building is provided 100 feet wide fuel modification zones consisting of the graded pad. This is based on the Fire Code (4908.1) that provides an exemption from fuel modification zones for structures that are constructed of non-combustible materials, open on all sides, and not used for storage or habitation. The water tank is not open on all sides, but is non-combustible and does not store flammable materials and is not used for habitation.

Specific Landscaping Requirements

The following requirements are provided for HOA-maintained fuel modification zones. All landscaping shall be maintained by the HOA.

Plants used in the fuel modification areas or landscapes will include drought-tolerant, fire-resistive trees, shrubs, and groundcovers. The planting list and spacing will be reviewed and approved by LACoFD, included on submitted landscape plans. The plantings will be consistent with the LACoFD Suggested Plant Reference Guide (refer to Appendix D-1). The suggested plant reference guide intends to provide examples of plants that are less prone to ignite or spread flames to other vegetation and combustible structures during a wildfire. Additional Plants can be added to the landscape plant material palette with approval from LACoFD.

Pre-Construction Requirements

- Perimeter fuel modification areas must be implemented and approved by the LACoFD before combustible materials are brought on site.
- Existing flammable vegetation shall be reduced by 50% within the development footprint upon commencement of construction.
- Dead fuel, ladder fuel (fuel which can spread fire from the ground to trees), and downed fuel shall be removed, and trees/shrubs shall be properly limbed, pruned, and spaced per the plan.

Undesirable Plants

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be physical (structure promotes ignition or combustible) or chemical (volatile chemicals increase flammability or combustion characteristics). The plants included in the FMZ Undesirable Plan List (refer to Appendix D-2) are unacceptable from a fire safety standpoint and shall not be planted or allowed to establish opportunistically within the FMZs or landscape areas.

5.6.2 FMZ Vegetation Management

All fuel modification area vegetation management within the FMZs shall be completed annually by May 1 of each year and more often as needed for fire safety, as determined by the LACoFD.

The individual homeowners shall be responsible for all fuel modification vegetation management on their lots in compliance with the plan and the LACoFD requirements. The Project HOA shall be responsible for all fuel modification vegetation management for all common areas of the Project site, including roadsides clearance and fuel modification zones. The Project HOA will assure private homeowner lots comply with the plan initially and on an ongoing basis. Chapter 7A requirements for ongoing maintenance of fire-resistive building materials and fire sprinkler systems will be included in the CC&R's and Deed encumbrances for each lot. Maintenance is minimal as the protections are “passive”, i.e., not requiring intervention to function as intended. Maintenance will include assuring all features are in working condition and when replacement is required, the replacement will be at least as ignition resistant as the original. For example, a broken window will be replaced with a dual pane, one tempered pane window and a broken roof tile will be replaced with a non-combustible tile. Additionally, the Project HOA shall be responsible for ensuring long-term funding and ongoing compliance with all provisions of the FPP, including vegetation planting, fuel modification on the perimeter, and maintenance requirements on all common areas and roadsides.

Maintenance of FMZ’s and Defensible Space is an important component for the long-term fire safety of the Project. maintenance obligations will be as follows:

- All future plantings shall be in accordance with LACoFD Fuel modification Guidelines.
- All single-family lots will be required to submit plans to the Fuel Modification prior to landscaping being installed and must be identified in the CC&R’s.
- Changing landscaping in common areas or individual lots will be revied by the Fuel Modification Unit and approved prior to installation.

Project HOA:

The following requirements of the Project’s HOA will be memorialized in the CC&Rs for the Project:

- The Project HOA will maintain the access roads, including a minimum of 10 feet clearance on each side of the road(s) within the Development Footprint adjacent to open space areas.
- The Project HOA will be required to annually maintain the FMZs (or as needed).
- The Project HOA will maintain all common areas, including trees planted along roadways and in other areas throughout Project.

Resident/Homeowner:

- Maintenance of vegetation on single-family property lots.
- Adjoining home homeowners are responsible for offsite brush clearance.

5.6.3 Annual FMZ Compliance Inspection

To confirm that the Project's FMZs and landscape areas are being maintained in accordance with this FPP and the LACoFD's fuel modification guidelines, the Project HOA will obtain an FMZ inspection and report in May/June of each year certifying that vegetation management activities throughout the Project site have been performed. If the FMZ areas are not compliant, the Project HOA will have a specified period to correct any noted issues so that a re-inspection can occur, and certification can be achieved. Annual inspection fees are subject to the current Fire Department Fee Schedule. All required offsite brush clearance will be inspected and enforced by LACoFD.

5.6.4 Construction Phase Vegetation Management

Vegetation management requirements shall be implemented at commencement and throughout the construction phase. Vegetation management for the Project area shall be performed pursuant to the FPP and LACoFD requirements on all building locations prior to the start of work and prior to any import of combustible construction materials. Combustible materials will not be brought on-site without prior fire department approval.

In addition to the requirements outlined above, the Project will comply with the following important risk-reducing vegetation management guidelines:

- All-new power lines shall be installed underground for fire safety purposes. Temporary construction power lines may be allowed in areas that have been cleared of combustible vegetation.
- Temporary construction powerlines shall only be installed in designated areas that have been cleared of combustible vegetation.
- Caution must be used not to cause erosion or ground (including slope) instability or water runoff due to vegetation removal, vegetation management, maintenance, landscaping, or irrigation.

Figure 10 Fuel Modification Zones Map

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5.7 Pre-Construction Requirements

Per Los Angeles County Fire Code, 4908.1, a fuel modification plan shall be submitted and have preliminary approval prior to any subdivision of land; or, have final approval prior to the issuance of a permit for any permanent structure used for habitation; where, such structure or subdivision is located within areas designated as a Fire Hazard Severity Zone within State Responsibility Areas or Very High Fire Hazard Severity Zone within the Local Responsibility areas, applicable Fire Hazard Zone maps, and Appendix M of the code at the time of application. An on-site inspection must be conducted by the personnel of the Forestry Division of the Fire Department and final approval of the fuel modification plan issued by the Forestry Division prior to a certificate of occupancy being granted by the building code official.

As an additional consultant recommendation, prior to bringing lumber or combustible materials onto the Project site, improvements within the active development area shall be in place, including utilities, operable fire hydrants, an approved, temporary roadway surface, and fuel modification zones established.

5.8 Activities in High Fire Hazard Severity Zone

The Project would comply with CFC Chapter 33 Fire Safety During Construction and Demolition designating fire safety measures to reduce the possibility of fires during all phases of construction activities. CFC Chapter 33 includes precautionary measures, such as, but not limited to: fire watch/fire guards during hot works and heavy machinery activities (e.g., welding), spark arresters on all equipment, requiring fire access during construction, water supply via hose lines attached to hydrants or a water tender pursuant to LACoFD requirements, red flag period restrictions, required on-site fire prevention resources, and others. The Project would also comply with Title 32 Section 326 of the County Fire Code, Activities in Wildfire Risk Area, which provides safeguards to prevent the occurrence of fire and control the spread of fires that may be caused by activities in a wildfire risk area. To prevent ignitions from construction based machinery, the Project would adhere to Section 326.12.1 of the Fire Code which prohibits the use or operation of any tractor, construction equipment, engine, machinery, or any steam, oil, or gasoline-operated stationary or mobile equipment, from which a spark or fire may originate unless such equipment is provided with a qualified device or spark arrester installed in or attached to the exhaust pipe which will prevent the escape of fire or sparks.

6 Alternative Materials and Methods

As previously mentioned, due to the reliance of up to 146 feet of off-site brush clearancealong the eastern boundary of the southwestern portion of the Project site, this FPP incorporates the use of a 6-foot heat-deflecting wall that will be positioned along the exposed boundary of the Project's southwestern portion of the Project site, as depicted in Figure 10. This same approach is proposed around the chemical feed building, which receives 100 feet of FMZ. This additional fire protection measure is customized for the Project site based on the analysis results and focus on providing functional equivalency as fuel modification zone adjacent to open space areas. Additionally, based on fire behavior analysis, fuels within the open space areas are not expected to pose a significant threat to Project structures.

Research has indicated that the closer a fire is to a structure, the higher the level of heat exposure (Cohen 2000). However, studies indicate that given certain assumptions (e.g., 10 meters of low fuel landscape, no open windows), wildfire does not spread to homes unless the fuel and heat requirements (of the home) are sufficient for ignition and continued combustion (Cohen 1995, Alexander et al. 1998). Construction materials and methods can prevent or minimize ignitions. Similar case studies indicate that with nonflammable roofs and vegetation modification from 10–18 meters (roughly 32–60 feet) in southern California fires, 85–95% of the homes survived (Howard et al. 1973, Foote and Gilless 1996). Similarly, San Diego County after fire assessments indicate strongly that the building codes are working in preventing home loss: of 15,000 structures within the 2003 fire perimeter, 17% (1,050) were damaged or destroyed. However, of the 400 structures built to the 2001 codes (the most recent at the time), only 4% (16) were damaged or destroyed. Further, of the 8,300 homes that were within the 2007 fire perimeter, 17% were damaged or destroyed. A much smaller percentage (3%) of the 789 homes that were built to 2001 codes were impacted and an even smaller percentage (2%) of the 1,218 structures built to the 2004 Codes were impacted (IBHS 2008). Damage to the structures built to the latest codes is likely from flammable landscape plantings or objects next to structures or open windows or doors (Hunter 2008).

These results support Cohen's (2000) findings that if a community's homes have a sufficiently low home ignitability (i.e., 2017 San Diego County Consolidated Code and 2016 California Building Code), the community can survive exposure to wildfire without major fire destruction. This provides the option of mitigating the wildland fire threat to homes/structures at the residential location without extensive wildland fuel reduction. Cohen's (1995) studies suggest, as a rule-of-thumb, larger flame lengths and widths require wider fuel modification zones to reduce structure ignition. For example, valid Structure Ignition Assessment Model (SIAM) results indicate that a 20-foot high flame has minimal radiant heat to ignite a structure (bare wood) beyond 33 feet (horizontal distance). Whereas, a 70-foot high flame may require about 130 feet of clearance to prevent structure ignitions from radiant heat (Cohen and Butler 1996). This study utilized bare wood, which is more combustible than the ignition resistant exterior walls for structures built today.

Obstacles, including non-combustible walls can block or deflect all or part of the radiation and heat, thus making narrower fuel modification distances possible. Fire behavior modeling conducted for the Project indicates that fires in the open space area would result in roughly 10-foot flame lengths under summer conditions. Extreme conditions may result in longer flame lengths approaching 20.5 feet.

As indicated in this report, the provided FMZs and additional fire protection measures proposed for the Project provides equivalent wildfire buffer for structures adjacent to open space lands. Rather, they are based on a variety of analysis criteria including predicted flame length, fire intensity (Btu), Project site topography and vegetation, extreme and typical weather, position of structures on pads, position of roadways, adjacent fuels, fire history, current vs. proposed land use, neighboring communities relative to the Project, and type of construction. The fire intensity research conducted by Cohen (1995), Cohen and Butler (1996), and Cohen and Saveland (1997) and Tran et al. (1992) supports the fuel modification alternative proposed for the Project.

6.1 Additional Structural Protection Measures

The following additional measures will be implemented for the southwestern portion of the site where a substantial portion of the FMZ is off-site along the eastern boundary. The following features are provided for additional fire prevention, protection, and suppression:

1. Windows on structures facing the open space areas shall include dual panes, with both panes tempered (code exceeding).
2. Exterior walls and doors shall be constructed to a standard of Minimum 1-hour fire rated with one layer of 5/8-inch type X gypsum sheathing applied behind the exterior covering or cladding on the exterior side of the framing, from the foundation to the roof, for all exterior walls of each building. (code exceeding)
3. Exterior vents shall be ember-resistant (recommend BrandGuard, O'Hagin, or similar vents approved by LACoFD) (code exceeding).
4. A solid 6-foot tall wall shall be constructed of concrete masonry units (CMUs) between on-site structures and off-site open space (code exceeding).
5. Annual inspections to evaluate FMZ areas site wide to confirm they meet the requirements of this FPP and LACoFD (code exceeding).

Implementation of these additional fire protection features would justify a reduced FMZ, even though the full 200 feet will be provided, including off-site brush clearance. The information provided herein supports the ability of the proposed structures and FMZs to withstand the predicted short duration, low to moderate intensity wildfire, and ember shower that would be expected from a wildfire burning in the vicinity of the Project site or within the Project site's landscape.

7 Wildfire Education Program

Early evacuation for any type of wildfire emergency at the Project site is the preferred method of providing for resident safety, consistent with the LACoFD's current approach within Los Angeles County. As such, the Project's Homeowner's Association (HOA) would formally adopt, practice, and implement a "Ready, Set, Go!" approach to evacuation[4]. The "Ready, Set, Go!" concept is widely known and encouraged by the State of California and most fire agencies. Pre-planning for emergencies, including wildfire emergencies, focuses on being prepared, having a well-defined plan, minimizing the potential for errors, maintaining the Project site's fire protection systems, and implementing a conservative (evacuate as early as possible) approach to evacuation and Project area activities during periods of fire weather extremes.

Project residents and occupants would be provided ongoing education regarding wildfires and the FPP's requirements. The educational information must include maintaining the landscape and structural components according to the appropriate standards designed for the community. Informational handouts, community website pages, mailers, fire-safe council participation, inspections, and seasonal reminders are some methods that would be used to disseminate wildfire and relocation awareness information. LACoFD would review and approve all wildfire educational material/programs before printing and distribution.

[4] https://www.fire.lacounty.gov/rsg/

8 Conclusion

The requirements and recommendations set forth in this FPP meet fire safety, building design elements, infrastructure, fuel management/modification, and landscaping recommendations of the applicable codes. The recommendations provided in the FPP have also been designed specifically for the proposed construction of structures within areas designated as VHFHSZ. When properly implemented on an ongoing basis, the fire protection strategies proposed in this FPP should significantly reduce the potential fire threat to vegetation on the community and its structures, as well as assist LACoFD in responding to emergencies within the Project site. The fire protection system provided for the Project site includes a redundant layering of code-compliant, fire-resistant construction materials and methods that have been shown through post-fire damage assessments to reduce the risk of structural ignition. Additionally, modern infrastructure would be provided, and all structures are required to include interior, automatic fire sprinklers consistent with the County's regulatory standards. Further, the proposed fuel modification on perimeter edges adjacent to the open space areas would provide a buffer between fuels in the open space and structures within the Project site.

Note that this is a conceptual plan, which provides enough detail for LACoFD approval. Detailed plans, such as improvement plans and building permits, demonstrating compliance with the concepts in the FPP and with County Fire Code requirements, would be submitted to LACoFD at the time they are developed.

Fire is a dynamic and somewhat unpredictable occurrence and as such, this FPP does not guarantee that a fire will not occur or will not result in injury, loss of life, or loss of property. There are no warranties, expressed or implied, regarding the suitability or effectiveness of the recommendations and requirements in this FPP, under all circumstances.

The Project's developers, contractors, engineers, and architects are responsible for the proper implementation of the concepts and requirements set forth in the FPP. Homeowners and property managers are also responsible for maintaining their structures and lots, including fuel modification and landscape, as required by this FPP, the LACoFD, and as required by the County Fire Code. Alternative methods of compliance with this FPP can be submitted to the fire authority and for consideration.

It will be extremely important for all homeowners, property managers, and occupants to comply with the recommendations and requirements described and required by the FPP on their property. The responsibility to maintain the fuel modification and fire protection features required for the Project site lies with the homeowners. The HOA or similar entity would be responsible for ongoing education and maintenance of the common areas, and the LACoFD would enforce the vegetation management requirements detailed in this FPP. Such requirements would be made a part of deed encumbrances and CC&Rs for each lot, as appropriate.

It is recommended that the homeowners or other occupants who may reside within the Lyons Canyon development adopt a conservative approach to fire safety. The approach must include maintaining the landscape and structural components according to the appropriate standards and embracing a "Ready, Set, Go" stance on evacuation.

The Project is not to be considered a shelter-in-place development. However, the fire agencies and/or law enforcement officials may, during an emergency, as they would for any new development providing the layers of fire protection as the Project, determine that it is safer to temporarily refuge residents on-site. When an evacuation is ordered, it will occur according to pre-established evacuation decision points or as soon as notice to evacuate is received, which may vary depending on many environmental and other factors. It is important for anyone living at the WUI to educate themselves on practices that will improve safety.

The goal of the fire protection features, both required and those offered above and beyond the Codes, provided for the Project is to provide the structures with the ability to survive a wildland fire with little intervention of firefighting forces. Preventing ignition to structures results in a reduction of the exposure of firefighters and residents to hazards that threaten personal safety. It will also reduce property damage and losses. Mitigating ignition hazards and fire spread potential reduces the threat to structures and can help the fire department optimize the deployment of personnel and apparatus during a wildfire. The analysis in this FPP provides support and justifications for acceptance of the proposed fuel modification zones for the proposed Lyons Canyon Project Development Footprint based on the site-specific fire environment.

Based on the results of this FPP's analysis and findings, the FPP implementation measures presented in Table 9 summarize code-required measures; Table 10 summarizes measures offered that are code exceeding or mitigating through alternative means and methods.

Table 9. Code-Required Fire Safety Features

Feature No.	Features Description
1	**Ignition-Resistant Construction.** Project buildings would be constructed of ignition-resistant construction materials based on the latest Building and Fire Codes (see Section 5.1.9 and Section 5.6.1 for details regarding ignition-resistant construction materials).
2	**Interior Fire Sprinklers.** All structures over 500 square feet, or what the current adopted code requires, would include interior fire sprinklers meeting code requirements.
3	**Fuel Modification Zones.** Provided throughout the perimeter of the Development Footprint and are 200 feet wide. Water tank's chemical feed building receives 100 feet of FMZ. Maintenance would occur as needed, and the HOA would annually hire a third party, LACoFD-approved, FMZ inspector to provide annual certification that it meets the requirements of this FPP.
4	**Fire Apparatus Access.** Provided throughout the community and would vary in width and configuration but would all provide at least the minimum required unobstructed travel lanes, lengths, turnouts, turnarounds, and clearances required by the applicable code.
5	**Firefighting Improvements.** Firefighting staging areas and temporary refuge areas are available throughout the Project's developed areas and along roadways and HOA open space.
6	**Water Availability.** Water capacity and delivery would provide for a reliable water source for operations and during emergencies requiring extended fire flow.
7	**Pre-Construction Requirements.** Construction documents for FD access and hydrant systems are to be submitted to the FD for approval prior to construction. Additionally, access roads and water supply are to be installed prior to construction.

Table 10. Code Exceeding or Alternative Materials and Methods Fire Safety Measures

Measure No.	Code Exceeding or Alternative Material or Method Measure
1	**Pre-Construction Requirements.** the Project would prepare a Construction Fire Prevention Plan (CFPP) that will designate fire safety measures to reduce the possibility of fires during the construction phase. The CFPP may include the following measures: fire watch/ fire guards during hot works and heavy machinery activities, hose lines attached to hydrants or a water tender, Red flag warning weather period restrictions, required on-site fire resources, and others as determined necessary. Additionally, prior to bringing lumber or combustible materials onto the Project site, improvements within the active development area shall be in place, including utilities, operable fire hydrants, an approved, temporary roadway surface, and fuel modification zones established.
2	**Community Evacuation Plan.** A Project-specific evacuation plan has been prepared for the Project and includes input and review with LACoFD.
3	**HOA Wildfire Education and Outreach.** The Community HOA would oversee landscape committee enforcement of fire safe landscaping, ensure fire safety measures detailed in this FPP have been implemented, and educate residents on and prepare facility-wide "Ready, Set, Go!" plans. Further, the Community HOA would conduct annually or hire a third party to manage an outreach and emergency preparedness education and coordination with LACoFD.
4	**FMZ Zone Markers.** To ensure long-term identification and maintenance, a fuel modification area shall be identified by a permanent zone marker meeting the approval of LACoFD. All markers will be located along the perimeter of the fuel modification area at a minimum of 500 feet apart or at any direction change of the fuel modification zone boundary. FMZs will be maintained on at least an annual basis or more often as needed to maintain the fuel modification buffer function.
5	**Fuel Modification Zone Inspections.** The HOA's CCRs shall require annual fuel modification inspections to be conducted to confirm and document compliance with fuel modification maintenance requirements, as defined in the Los Angeles County Fire Department (LACoFD)-approved Fuel Modification Plan. The HOA shall obtain a fuel modification zone (FMZ) inspection and report in May/June of each year to document and certify that vegetation management activities throughout the Project site have been performed. If the FMZ areas are not compliant, the HOA shall have a specified period to correct any noted issues, and re-inspection shall be required to achieve the annual certification of compliance. Documentation of compliance shall be retained by the HOA.
6	**Ongoing Building and Infrastructure Maintenance.** The Project's HOA(s) shall be responsible for long term funding and maintenance of private roads and fire protection systems, including fire sprinklers and private fire hydrants.
7	**Alternative Materials and Methods.** The Project will also include the following features for additional fire prevention, protection, and suppression for 16 lots in the southern portion of the Project where off-site brush clearance would be required from neighboring property owners:: 1. Windows on structures facing the open space areas shall include dual panes, with both panes tempered. 2. Exterior walls and doors shall be constructed to a standard of Minimum 1-hour fire rated with one layer of 5/8-inch type X gypsum sheathing applied behind the exterior covering or cladding on the exterior side of the framing, from the foundation to the roof, for all exterior walls of each building. 3. Exterior vents shall be ember-resistant (recommend BrandGuard, O'Hagin, or similar vents approved by LACoFD). 4. A solid 6-foot tall wall shall be constructed of concrete masonry units (CMUs) between on-site structures and off-site open space.

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Appendix A
Photograph Log

Photograph 1: Looking south across the Project site from the southeast portion of the Stevenson Ranch development.

Photograph 2: Looking west down an access road on the southern portion of the Stevenson Ranch development. The Project site is south of the access road.

Photograph 3:

Photograph 4:

Photograph 5:

Photograph 6:

Photograph 7.

Photograph 8.

Photograph 9.

Photograph 10.

Photograph 11:

Photograph 12:

Photograph 13:

Photograph 14:

Photograph 15:

Photograph 16:

Photograph 17:

Photograph 18:

Photograph 19.

Photograph 20.

Photograph 21.

Photograph 22.

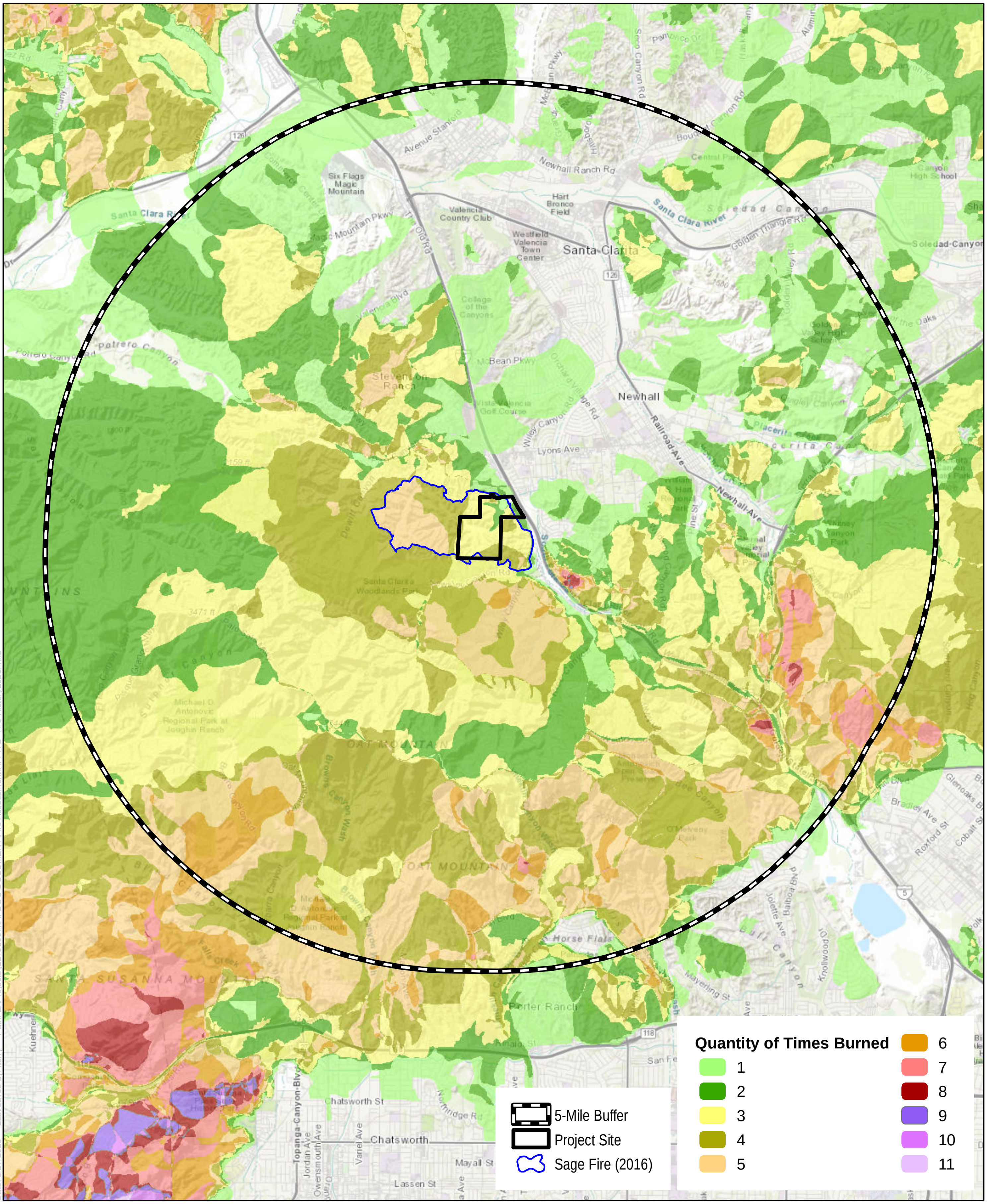
Photograph 23:

Photograph 24:

Photograph 25:

Photograph 26:

Appendix B
Fire History



SOURCE: AERIAL- BING MAPPING SERVICE; FIRE DATA-CALFIRE 2021

DUDEK

0 1 2 Miles

APPENDIX B

Fire History Map

Fire Protection Plan for the Trails at Lyons Canyon Projec

Appendix C
Fire Behavior Analysis

DUDEK
MAIN OFFICE
605 THIRD STREET
ENCINITAS, CALIFORNIA 92024
T 800.450.1818 F 760.632.0164

FIRE BEHAVIOR MODELING SUMMARY
THE TRAILS AT LYON'S CANYON

1 BehavePlus Fire Behavior Modeling History

Fire behavior modeling has been used by researchers for approximately 50+ years to predict how a fire will move through a given landscape (Linn 2003). The models have had varied complexities and applications throughout the years. One model has become the most widely used as the industry standard for predicting fire behavior on a given landscape. That model, known as "BEHAVE", was developed by the U. S. Government (USDA Forest Service, Rocky Mountain Research Station) and has been in use since 1984. Since that time, it has undergone continued research, improvements, and refinement. The current version, BehavePlus 6.0, includes the latest updates incorporating years of research and testing. Numerous studies have been completed testing the validity of the fire behavior models' ability to predict fire behavior given site specific inputs. One of the most successful ways the model has been improved has been through post-wildfire modeling (Brown 1972, Lawson 1972, Sneeuwjagt and Frandsen 1977, Andrews 1980, Brown 1982, Rothermel and Rinehart 1983, Bushey 1985, McAlpine and Xanthopoulos 1989, Grabner, et. al. 1994, Marsden-Smedley and Catchpole 1995, Grabner 1996, Alexander 1998, Grabner et al. 2001, Arca et al. 2005). In this type of study, Behave is used to model fire behavior based on pre-fire conditions in an area that recently burned. Real-world fire behavior, documented during the wildfire, can then be compared to the prediction results of Behave and refinements to the fuel models incorporated, retested, and so on.

Fire behavior modeling conducted on this site includes a relatively high-level of detail and analysis which results in reasonably accurate representations of how wildfire may move through available fuels on and adjacent the property. Fire behavior calculations are based on site-specific fuel characteristics supported by fire science research that analyzes heat transfer related to specific fire behavior. To objectively predict flame lengths, spread rates, fireline intensities, and spotting distances, this analysis incorporated predominant fuel characteristics, slope percentages, and representative fuel models observed on site. The BehavePlus fire behavior modeling system was used to analyze anticipated fire behavior within and adjacent to key areas just outside of the proposed lots. Predicting wildland fire behavior is not an exact science. As such, the movement of a fire will likely never be fully predictable, especially considering the variations in weather and the limits of weather forecasting. Nevertheless, practiced and experienced judgment, coupled with a validated fire behavior modeling system, results in useful and accurate fire prevention planning information. To be used effectively, the basic assumptions and limitations of BehavePlus must be understood.

- First, it must be realized that the fire model describes fire behavior only in the flaming front. The primary driving force in the predictive calculations is dead fuels less than one-quarter inch in diameter. These are the fine fuels that carry fire. Fuels greater than one inch have little effect while fuels greater than three inches have no effect on fire behavior.

- Second, the model bases calculations and descriptions on a wildfire spreading through surface fuels that are within six feet of the ground and contiguous to the ground. Surface fuels are often classified as grass, brush, litter, or slash.
- Third, the software assumes that weather and topography are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
- Fourth, the BehavePlus fire behavior computer modeling system was not intended for determining sufficient fuel modification zone/defensible space widths. However, it does provide the average length of the flames, which is a key element for determining "defensible space" distances for minimizing structure ignition.

Although BehavePlus has some limitations, it can still provide valuable fire behavior predictions which can be used as a tool in the decision-making process. In order to make reliable estimates of fire behavior, one must understand the relationship of fuels to the fire environment and be able to recognize the variations in these fuels. Natural fuels are made up of the various components of vegetation, both live and dead, that occur on a site. The type and quantity will depend upon the soil, climate, geographic features, and the fire history of the site. The major fuel groups of grass, shrub, trees, and slash are defined by their constituent types and quantities of litter and duff layers, dead woody material, grasses and forbs, shrubs, regeneration, and trees. Fire behavior can be predicted largely by analyzing the characteristics of these fuels. Fire behavior is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content, and chemical properties.

The seven fuel characteristics help define the 13 standard fire behavior fuel models[1] and the five custom fuel models developed for Southern California[2]. According to the model classifications, fuel models used in BehavePlus have been classified into four groups, based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. Observation of the fuels in the field (on site) determines which fuel models should be applied in BehavePlus. The following describes the distribution of fuel models among general vegetation types for the standard 13 fuel models and the custom Southern California fuel models:

- Grasses — Fuel Models 1 through 3
- Brush — Fuel Models 4 through 7, SCAL 14 through 18
- Timber — Fuel Models 8 through 10
- Logging Slash — Fuel Models 11 through 13

In addition, the aforementioned fuel characteristics were utilized in the recent development of 40 new fire behavior fuel models[3] developed for use in BehavePlus modeling efforts. These new models attempt to improve the accuracy of the

1 Anderson, Hal E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. USDA Forest Service Gen. Tech. Report INT-122. Intermountain Forest and Range Experiment Station, Ogden, UT.
2 Weise, D.R. and J. Regelbrugge. 1997. Recent chaparral fuel modeling efforts. Prescribed Fire and Effects Research Unit, Riverside Fire Laboratory, Pacific Southwest Research Station. 5p.
3 Scott, Joe H. and Robert E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

standard 13 fuel models outside of severe fire season conditions, and to allow for the simulation of fuel treatment prescriptions. The following describes the distribution of fuel models among general vegetation types for the new 40 fuel models:

- Grass — Models GR1 through GR9
- Grass-shrub — Models GS1 through GS4
- Shrub — Models SH1 through SH9
- Timber-understory — Models TU1 through TU5
- Timber litter — Models TL1 through TL9
- Slash blowdown — Models SB1 through SB4

BehavePlus software was used in the development of this The Trails at Lyon's Canyon Project (Proposed Project) Fire Protection Plan (FPP) in order to evaluate potential fire behavior for the Project site. Existing site conditions were evaluated, and local weather data was incorporated into the BehavePlus modeling runs.

2 Fuel Models

Dudek utilized the BehavePlus software package to analyze fire behavior potential for the Proposed Project site in Santa Clarita, California. As is customary for this type of analysis, five fire scenarios were evaluated, including two summer, onshore weather condition (northwest and west/southwest from the Project Site) and three extreme fall, offshore weather condition (east, southeast, and south of the Project Site). Fuels and terrain at and beyond this distance can produce flying embers that may affect the project, but defenses have been built into the structures to prevent ember penetration and to extinguish fires that may result from ember penetration. It is the fuels adjacent to and within fuel modification zones that would have the potential to affect the project's structures from a radiant and convective heat perspective as well as from direct flame impingement. BehavePlus software requires site-specific variables for surface fire spread analysis, including fuel type, fuel moisture, wind speed, and slope data. The output variables used in this analysis include flame length (feet), rate of spread (feet/minute), fireline intensity (BTU/feet/second), and spotting distance (miles). The following provides a description of the input variables used in processing the BehavePlus models for the Proposed Project site. In addition, data sources are cited and any assumptions made during the modeling process are described.

Vegetation (Fuels)

To support the fire behavior modeling efforts conducted for this FPP, the different vegetation types observed adjacent to the site were classified into the aforementioned numeric fuel models. As is customary for this type of analysis, the terrain and fuels directly adjacent to the property are used for determining flame lengths and fire spread. It is these fuels that would have the potential to affect the project's structures from a radiant and convective heat perspective as well as from direct flame impingement.

Vegetation types were derived from a site visit that was conducted on June 15, 2020 by a Dudek Fire Protection Planner. Based on the site visit, six different fuel models were used in the current conditions of the fire behavior modeling effort and two additional fuel models were used to depict a fire post construction, as present herein. Fuel model attributes are summarized in Table 1. Modeled areas include Coast live oak stands with non-native chaparral and shrub understory (Fuel Model SH4 = Timber-Shrub) occur along western and southern borders of the site. Mature tree canopies for coast live oak trees (*Quercus agrifolia)* are assumed to have a canopy base height ranging from 20 to 35 feet off the ground. Canopy bulk density, the weight of canopy fuels per cubic foot of volume, is assumed to be the maximum allowable value in BehavePlus to represent broadleaf trees which, given canopy density and leaf size, have more weight per area than conifer trees (the standard for this value input in BehavePlus (Heinsch and Andrews 2010)). Foliar moisture, the moisture content of canopy foliage, is assumed to be 100%, a reasonable estimate in lieu of site-specific data (Scott and Reinhardt 2001).

Table 1. Existing Fuel Model Characteristics

Fuel Model	Description	Location	Fuel Bed Depth (Feet)
Gr4	Moderate load, Dry climate grasses	Fuel type throughout and adjacent to the western side of the Project boundary	>2.0 ft.
Gr7	High load, Dry climate grasses	Fuel type throughout and adjacent to the western side of the Project boundary	>5.0 ft.
Gs2	Moderate load, Dry Climate Grass-Shrub	Fuel type throughout and adjacent to the Project boundary; also will occur post development within Zone C - 50% thinning zone.	<3.0 ft.
Sh2	Moderate load, Dry Climate Shrub	Fuel type throughout and adjacent to the Project boundary	>3.0 ft.
Sh4	Coast Live Oak Trees (Timber Shrub)	Within the foothills west/northwest of the Project site and western property boundary, as well in the southern portion of the Project site.	<6.0 ft.
Sh5	High Load, Dry Climate Shrub	Fuel type throughout and adjacent to the Project boundary.	>4.0 ft.
FM8	Irrigated Landscape	Fuel type will occur post development within Zone A - setback irrigated zone.	<1.0 ft.
Gs1	Low Load, Dry Climate Grass-Shrub	Fuel type will occur post development within Zone B - Irrigated zone.	<2.0 ft.

Topography

Slope is a measure of angle in degrees from horizontal and can be presented in units of degrees or percent. Slope is important in fire behavior analysis as it affects the exposure of fuel beds. Additionally, fire burning uphill spreads faster than those burning on flat terrain or downhill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. Slope values ranging from 9 to 22% were measured around the perimeter of the proposed project site from U.S. Geological Survey (USGS) topographic maps.

Weather

Historical weather data for the Santa Clarita region was utilized in determining appropriate fire behavior modeling inputs for the Proposed Project area fire behavior evaluations. To evaluate different scenarios, data from both the 50th and 97th percentile moisture values were derived from Remote Automated Weather Station (RAWS) and utilized in the fire behavior modeling efforts conducted in support of this report. Weather data sets from the Newhall Pass RAWS[4] station were utilized in the fire modeling runs.

RAWS fuel moisture and wind speed data were processed utilizing the Fire Family Plus software package to determine atypical (97th percentile) and typical (50th percentile) weather conditions. Data from the RAWS was evaluated from August 1 through November 30 for each year between 1998 and 2020 (extent of available data record) for 97th percentile weather conditions and from June 1 through September 30 for each year between 1998 and 2020 for 50th percentile weather conditions.

Following analysis in Fire Family Plus, fuel moisture information was incorporated into the Initial Fuel Moisture file used as an input in BehavePlus. Wind speed data resulting from the Fire Family Plus analysis was also determined. Initial wind direction and wind speed values for the two BehavePlus runs were manually entered during the data input phase. The input wind speed and direction is roughly an average surface wind at 20 feet above the vegetation over the analysis area. Table 2 summarizes the wind and weather input variables used in the Fire BehavePlus modeling efforts.

Table 2. Variables Used for Fire Behavior Modeling

Model Variable	Summer Weather (50th Percentile)	Peak Fall Weather (97th Percentile)
Fuel Models	Gr4, Gr7, Gs2, Sh2, and Sh4 (Pre) FM8, Gs1, and Gs2 (Post)	Gs2, Sh4, and Sh5 (Pre) FM8, Gs1, and Gs2 (Post)
1 h fuel moisture	5	1
10 h fuel moisture	7	2
100 h fuel moisture	11	4
Live herbaceous moisture	45	30
Live woody moisture	90	60
20 ft. wind speed	14 mph (sustained winds)	18 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	240 and 310	80, 145, and 180
Wind adjustment factor	0.4	0.4
Slope (uphill)	9 to 18%	16 to 22%

4 https://wrcc.dri.edu/cgi-bin/rawMAIN.pl?caCNEW
Latitude: 34.337161 Longitude: -118.519972; Elevation: 2,141 ft.)

2.1 Fire Behavior Modeling Effort

As mentioned, the BehavePlus fire behavior modeling software package was utilized in evaluating anticipated fire behavior adjacent to the Proposed Project site. Five focused analyses were completed, each assuming worst-case fire weather conditions for a fire approaching the project site from the northwest, east/northeast, southeast, south, and west/southwest. The results of the modeling effort included anticipated values for surface fires (flame length (feet), rate of spread (mph), and fireline intensity (Btu/ft/s)) and crown fires (critical surface intensity (Btu/ft/s), critical surface flame length (feet), transition ratio (ratio: surface fireline intensity divided by critical surface intensity), transition to crown fire (yes or no), crown fire rate of spread (mph), critical crown rate of spread (mph), active ratio (ratio: crown fire rate of spread divided by critical crown fire rate of spread), active crown fire (yes or no), and fire type (surface, torching, conditional crown, or crowning)). The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews, Bevins, and Seli 2008). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts (Rothermel and Rinehart 1983). Spotting distance is the distance a firebrand or ember can travel down wind and ignite receptive fuel beds. Four fire modeling scenario locations were selected to better understand the different fire behavior that may be experienced on or adjacent the site based on slope and fuel conditions; these four fire scenarios are explained in more detail below:

- **Scenario 1:** A summer, on-shore fire (50th percentile weather condition) burning in moderate-load chaparral and shrubs and through the understory vegetation beneath off-site coast live oak tree community's northwest of the Project site. The terrain is moderately steep (18% slope) with potential ignition sources from a wildfire originating in the open space areas to the northwest. This type of fire would typically spread downhill towards existing residential communities north of the proposed site before reaching the Project site.
- **Scenario 2:** A fall, off-shore fire (97th percentile weather condition) burning in the moderate to high-load chapparal intermixed with grass-shrubs along the Interstate 5 (I-5) freeway east of the proposed project site. The terrain is moderately steep (up to 22% slope) with potential ignition sources from a vehicle fire along I-5 or a house fire from the existing residential communities to the east/northeast. This type of fire would typically spread downhill towards the proposed Project site.
- **Scenario 3:** A fall, off-shore fire (97th percentile weather condition) burning in moderate to high-load chaparral and shrubs and through the understory vegetation beneath off-site coast live oak tree community's southwest of the proposed Project site. The terrain is moderately steep (16% slope) with potential ignition sources from a vehicle fire along I-5 to the east/southeast and/or a wildfire originating in the open space areas to the south/southeast. This type of fire would typically spread downhill towards the proposed Project site.
- **Scenario 4:** A fall, off-shore fire (97th percentile weather condition) moderate to high-load chaparral chapparal intermixed with grass-shrubs south of the proposed Project site. The terrain is moderately steep

(17% slope) with potential ignition sources from a wildfire originating in the open space areas to the south. This type of fire would typically spread downhill towards the proposed Project site

- **Scenario 5:** A summer, on-shore fire (50th percentile weather condition) moderate-load chaparral and shrubs southwest/west of the Project site. The terrain is moderately steep (9% slope) with potential ignition sources from a wildfire originating in the open space areas to the west/southwest. This type of fire would typically spread downhill towards the proposed Project site.

3 Fire Behavior Modeling Results

The results presented in Tables 3 and 4 depict values based on inputs to the BehavePlus software and are not intended to capture changing fire behavior as it moves across a landscape. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. For planning purposes, the averaged worst-case fire behavior is the most useful information for conservative fuel modification design. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

Based on the BehavePlus analysis result presented below and in Tables 3 and 4, worst-case fire behavior is expected in untreated, surface shrub and chaparral fuels south/southwest of the proposed Project site under Peak weather conditions (represented by Fall Weather, Scenario 3). The analyzed worse-case fire is anticipated to be a wind-driven fire from the east during a fall, Santa Ana wind event. Under such conditions, predicted surface flame lengths would be approximately 25 feet under 18 mph sustained winds and could reach up to 45 feet under wind speeds of up to 50-plus mph. Under this scenario, fireline intensities reach 21,884 BTU/feet/second with fast spread rates of 6.8 mph and could have a spotting distance up to 2.4 miles away.

Fires burning from the west/northwest and pushed by ocean breezes typically exhibit less severe fire behavior due to lower wind speeds and higher humidity. Under typical onshore weather conditions, a chaparral scrub fire could have flame lengths between approximately 11 feet and 22 feet in height and spread rates between 0.1 and 2.0 mph. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.2 to 0.6 miles.

As previously mentioned, Dudek conducted modeling of the site for post-fuel modification zones. Typical fuel modification includes establishment of minimum 100-foot wide irrigated zone (Zones A and B) and a 100-foot wide thinning zone (Zone C) on the periphery of the project site, beginning at the structure. For modeling the post-FMZ treatment condition, the fuel model assignment for non-native grasslands was re-classified according to the specific fuels management (e.g., irrigated, fire resistive landscaping and 50% thinning) treatment.

Based on the BehavePlus analysis, post development fire behavior is expected in irrigated and replanted with plants that are acceptable with LACoFD (Zones A - FM8 and B – Gs1), as well in an area with 50% thinning of the existing shrubs (Gs2) under peak weather conditions (represented by Fall Weather, Scenario 3). Under such conditions, expected surface flame length is expected to be significantly lower, with flames lengths reaching approximately 20 feet with wind speeds of 50+ mph. Under this scenario, fire line intensities reach 4,022 BTU/feet/second with relatively slow spread rates of 4.2 mph and could have a spotting distance up to 1.4 miles away. Therefore, the 150-foot Fuel Modification Zone (FMZ) proposed for the proposed Project site is approximately 3-4-times the flame length of the worst case fire scenario under peak weather conditions and would provide adequate defensible space to augment a wildfire approaching the perimeter of the Project site.

Table 3. RAWS BehavePlus Fire Behavior Modeling Results – Existing Conditions

Fire Scenario	Flame Length[1] (Feet)	Spread Rate[1] (MPH[5])	Fireline Intensity[1] (Btu/ft./sec.)	Spot Fire[1] (miles)	Surface Fire to Tree Crown Fire	Tree Crown Fire Rate of Spread (MPH)	Crown Fire Flame Length (feet)
Scenario 1: 18% slope; Summer Onshore Wind from northwest (50th percentile)							
Coast Live Oak Trees[2,3] (Sh4)	7.5	0.4	447	0.3	Crowning [4]	0.5	67.3
Moderate-load Sagebrush scrub (Sh2)	3.6	0.1	93	0.2	Crowning [4]	0.5	68.1
Moderate-load Grass-Shrub (Gs2)	5.7	0.4	253	0.2	Crowning [4]	0.5	66.1
High-load Grasses (Gr7)	22.7	2.0	5,014	0.6	Crowning [4]	0.5	71.9
Scenario 2: 22% slope; Fall extreme offshore Wind from east (97th percentile)							
Moderate Load Grass-Shrub (Gs2)	10.7 (20.6)[6]	1.0 (4.3)	971 (4,080)	0.4 (1.4)	No	N/A	N/A
High Load Sagebrush scrub (Sh5)	26.3 (45.0)	2.1 (6.9)	6,914 (22,268)	0.8 (2.4)	No	N/A	N/A
Scenario 3: 16% slope; Fall extreme offshore Wind from southeast (97th percentile)							
Coast Live Oak Trees[2,3] (Sh4)	12.4 (23.8)[6]	1.0 (4.2)	1,357 (5,600)	0.5 (1.6)	Crowning [4]	1.1 (4.4)	119.9 (308.3)
High Load Sagebrush scrub (Sh5)	25.6 (44.6)	2.0 (6.8)	6,531 (21,884)	0.8 (2.4)	Crowning [4]	1.1 (4.4)	130.8 (336.4)
Scenario 4: 17% slope; Fall extreme offshore Wind from south (97th percentile)							
Moderate Load Grass-Shrub (Gs2)	12.4 (23.8)[6]	1.0 (4.2)	1,347 (5,590)	0.5 (1.6)	No	N/A	N/A
High Load Sagebrush scrub (Sh5)	25.5 (44.6)	2.0 (6.7)	6,486 (21,840)	0.8 (2.4)	No	N/A	N/A
Scenario 5: 9% slope; Summer Onshore Wind from west/southwest (50th percentile)							
Moderate-load Grasses (gr4)	10.7	1.4	978	0.4	No	N/A	N/A
High-load Grasses (gr7)	22.6	2.0	5,002	0.6	No	N/A	N/A
Moderate-load Grass-Shrub (Gs2)	5.7	0.4	252	0.2	No	N/A	N/A

Moderate-load sagebrush scrub (Sh2)	3.6	0.1	93	0.2	No	N/A	N/A

Note:

1. Wind-driven surface fire.
2. Coast live oak tree understory torching increases fire intensity. Modeling included canopy fuel over Sh4, which represents surface fuels beneath the tree canopies.
3. A surface fire in the mixed coast live oak forest would transition into the tree canopies generating flame lengths higher than the average tree height (25 feet). Viable airborne embers could be carried downwind for approximately 0.7 miles and ignite receptive fuels.
4. Crowning= fire is spreading through the overstory crowns.
5. MPH=miles per hour.
6. Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

Table 4. RAWS BehavePlus Fire Behavior Modeling Results – Post Project Conditions

Fire Scenario	Flame Length[1] (feet)	Spread Rate[1] (MPH)[2]	Fireline Intensity (Btu/ft./sec.)	Spot Fire (miles)[3]
Scenario 1: 18% slope; Summer Onshore Wind from northwest (50th percentile)				
FMZ Zone A (FM8)	1.2	0.0	9	0.1
FMZ Zone B (Gs1)	4.0	0.3	113	0.2
FMZ Zone C (Gs2)	5.7	0.4	253	0.2
Scenario 2: 22% slope; Fall extreme offshore Wind from east (97th percentile)				
FMZ Zone A (FM8)	2.1 (3.0)[3]	0.1 (0.2)	28 (63)	0.1 (0.4)
FMZ Zone B (Gs1)	7.4 (14.0)	0.7 (3.0)	434 (1,763)	0.3 (1.1)
Scenario 3: 16% slope; Fall extreme offshore Wind from southeast (97th percentile)				
FMZ Zone A (FM8)	2.0 (3.0)	0.1 (0.2)	26 (63)	0.1 (0.4)
FMZ Zone B (Gs1)	7.2 (14.0)	0.7 (3.0)	409 (1,763)	0.3 (1.1)
FMZ Zone C (Gs2)	10.4 (20.5)	1.0 (4.2)	914 (4,022)	0.4 (1.4)
Scenario 4: 17% slope; Fall extreme offshore Wind from south (97th percentile)				
FMZ Zone A (FM8)	2.0 (3.0)	0.1 (0.2)	26 (63)	0.1 (0.4)
FMZ Zone B (Gs1)	7.1 (14.0)	0.7 (3.0)	406 (1,763)	0.3 (1.1)
FMZ Zone C (Gs2)	10.3 (20.5)	0.9 (4.2)	907 (4,015)	0.4 (1.4)
Scenario 5: 9% slope; Summer Onshore Wind from west/southwest (50th percentile)				
FMZ Zone A (FM8)	1.2	0.0	9	0.1
FMZ Zone B (Gs1)	4.0	0.3	113	0.2
FMZ Zone C (Gs2)	5.7	0.4	252	0.2

Note:

1. Wind-driven surface fire.
2. MPH=miles per hour
3. Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph

The following describes the fire behavior variables (Heisch and Andrews 2010) as presented in Tables 3 and 4:

Surface Fire:

- Flame Length (feet): The flame length of a spreading surface fire within the flaming front is measured from midway in the active flaming combustion zone to the average tip of the flames.
- Fireline Intensity (Btu/ft/s): Fireline intensity is the heat energy release per unit time from a one-foot wide section of the fuel bed extending from the front to the rear of the flaming zone. Fireline intensity is a function of rate of spread and heat per unit area, and is directly related to flame length. Fireline intensity and the flame length are related to the heat felt by a person standing next to the flames.
- Surface Rate of Spread (mph): Surface rate of spread is the "speed" the fire travels through the surface fuels. Surface fuels include the litter, grass, brush and other dead and live vegetation within about 6 feet of the ground.

Crown Fire:

- Transition to Crown Fire: Indicates whether conditions for transition from surface to crown fire are likely. Calculation depends on the transition ratio. If the transition ratio is greater than or equal to 1, then transition to crown fire is Yes. If the transition ratio is less than 1, then transition to crown fire is No.
- Crown Fire Rate of Spread (mph): The forward spread rate of a crown fire. It is the overall spread for a sustained run over several hours. The spread rate includes the effects of spotting. It is calculated from 20-ft wind speed and surface fuel moisture values. It does not consider a description of the overstory.
- Fire Type: Fire type is one of the following four types: surface (understory fire), torching (passive crown fire; surface fire with occasional torching trees), conditional crown (active crown fire possible if the fire transitions to the overstory), and crowning (active crown fire; fire spreading through the overstory crowns). Dependent on the variables: transition to crown fire and active crown fire.

The information in Table 5 presents an interpretation of the outputs for five fire behavior variables as related to fire suppression efforts. The results of fire behavior modeling efforts are presented in Tables 3 and 4. Identification of modeling run locations is presented graphically in Figure 8 of the FPP.

Table 5. Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	Interpretations
Under 4 feet	Under 100 BTU/ft/s	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.

4 to 8 feet	100-500 BTU/ft/s	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8 to 11 feet	500-1000 BTU/ft/s	Fires may present serious control problems -- torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
Over 11 feet	Over 1000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Appendix D-1

LACoFD Suggested Plant Reference Guide

Appendix D:
Acceptable Plant List by Fuel Modification Zone

Botanical Name	Common Name	Zone[1]	Minimum Distance from Structure[2]
Ground Cover			
Acacia redolens 'Desert Carpet'/'Low Boy'	Desert Carpet Acacia	B	30
Achillea tomentosa	Woolly Yarrow	A	
Ajuga reptans	Carpet Bugle	A	
Arctostaphylos (Prostrate Varieties)	Manzanita	B	
Artemisia californica (Cultivars)	Sagebrush - Prostrate Forms	B	30
Artemesia 'Powis Castle'	NCN	B	
Baccharis pilularis 'Pigeon Point'/'Twin Peaks'	Prostrate Coyote Brush	B	
Campanula poscharkyana	Serbian Bellflower	A	
Ceanothus gloriosus	Point Reyes Ceanothus	B	
Cerastium tomentosum	Snow-In-Summer	A	
Chamaemelum nobile	Chamomile	A	
Cistus salviifolius 'Prostratus'	Sageleaf Rockrose	B	
Coprosma kirkii	Mirror Plant	B	
Coreopsis auriculata 'Nana'	Tickseed	A	
Cotoneaster (Prostrate Varieties)	Cotoneaster	B	
Dalea greggii	Trailing Indigo Bush	B	
Delosperma alba	White Training Ice Plant	A	
Dichondra micrantha	Dichondra	A	
Drosanthemum floribundum	Rosea Ice Plant	A	
Duchesnea indica	Indian Mock Strawberry	A	
Dymondia margaretae	NCN	A	
Erigeron glaucus	Seaside Daisy	A	
E. karvinskianus	Santa Barbara Daisy	B	
Euonymus fortunei 'Colorata'	Purple-Leaf Winter Creeper	B	
Festuca cinerea(ovina'Glauca')	Blue Fescue	A	
F. rubra	Red Fescue	A	
Fragaria chiloensis	Wild Strawberrry	A	
Gazania Hybrids	Trailing Gazania	A	
Geranium incanum/sanguineum	Cranesbill	A	
Glechoma hederacea	Ground Ivy	A	
Helianthemum nummularium	Sunrose	A	
Herniaria glabra	Green Carpet	A	
Heuchera species and Cultivars	Coral Bells	A	
Hypericum calycinum/coris	Aaron's Beard	B	
Iberis sempervirens	Evergreen Candytuft	A	
Iva hayesiana	Poverty Weed	B	30
Juniperus (Prostrate species/cultivars)		B	
Laurentia fluviatilis	Blue Star Creeper	A	
Lysimachia nummularia	Moneywort	A	
Liriope spicata	Creeping Lily Turf	A	

Liriope muscari	Lily Turf	A	
Mahonia repens	Creeping Mahonia	B	
Myoporum 'Pacificum' & 'Putah Creek'	Pacific Myoporum	B	
M. parvifolium	NCN	A	
Oenothera berlandieri	Mexican Evening Primrose	B	
O. stubbei	Baja Evening Primrose	A	
Ophiopogon japonicus	Mondo Grass	A	
Pachysandra terminalis	Japanese Spurge	A	
Pelargonium peltatum/tomentosum	Ivy Geranium	A	
Persicaria capitata	Pink Clover	A	
Phlox subulata	Moss Pink	A	10
Phyla nodiflora (Lippia repens)	Lippia	A	
Potentilla tabernaemontanii	Spring Cinquefoil	A	
Ribes viburnifolium	Catalina Perfume	B	
Rosmarinus officinalis (Prostrate Varieties)	Prostrate Rosemary	B	30
Scaevola 'Mauve Clusters'	NCN	A	
Salvia sonomensis	Creeping Sage	B	
Sedum species	Stonecrops	A	
Senecio mandraliscae/serpens	Kleinia/Blue Chalksticks	A	
Soleirolia soleirolii	Baby's Tears	A	
Teucrium cossonii majoricum	Germander	A	
T. X lucidrys 'Prostratum'	Prostrate Germander	A	
Thymus species	Mother of Thyme	A	
Trachelospermum jasminoides	Star Jasmine	A	
Trifolium fragiferum	White Clover	A	
Verbena species (Prostrate Varities)	Garden Verbena	A	
Vinca minor	Dwarf Periwinkle	A	
Viola odorata	Sweet Violet	A	
Wedelia trilobata	Yellow Dot	B	
Zoysia tenuifolia	Korean Grass	A	
Miscellaneous Perennials, Grasses, Ferns etc.			
Acorous gramineous and Cultivars	Sweet Flag	A	
Agapanthus africanus	Lily of the Nile	A	
Alstroemeria cooperi	Peruvian Lily	A	
Armeria species	Thrifts	A	
Bamboos	Bamboo	B	30
Bergenia cordifolia	Heart Leaf Bergenia	A	
Cycas species	Cycads	A	
Cyrtomium falcatum	Holly Fern	A	
Davalia tricomanoides	Rabbits Foot Fern	A	
Epilobium canum	California Fuchia	B	
Helictotrichon sempervirens	Blue Oat Grass	A	15
Hemerocallis hybrids	Daylily	A	
Iris douglassiana	Coastal Iris	A	
Iris germanica	Bearded Iris	A	

Kalanchoe species	Kalanchoe	A	
Leymus condensatus 'Canyon Prince'	Canyon Prince Wild Rye	B	
Lobelia laxiflora		A	10
Pelargonium species	Geranium	A	
Penstemon species	Beard Tongue	A	
Plumeria	Plumeria	A	
Phlebodium aureum	Rabbits Foot Fern	A	
Tulbaghia violacea	Society Garlic	A	
Zephyranthes candida	Zephyr Lily	A	
Shrubs			
Abelia grandiflora (Prostrata)	Glossy Abelia	A	10
Abutilon hybridum	Flowering Maple	A	10
Acanthus mollis	Bear's Breech	A	
Agave species	Agave	A	
Aloe species	Aloe	A	
Alyogyne huegelii	Blue Hibiscus	A	10
Arbutus unedo (Dwarf Cultivars)	Dwarf Strawberry Tree	A	10
Arctostaphylos species	Manzanita	B	
Aucuba japonica	Japanese Aucuba	A	
Baccharis species	Various	B	
Berberis thunbergii	Japanese Barberry	B	
B. thunbergii ' prostrate cultivars'		A	10
Bougainvillea sp.	Bougainvillea	B	
Buddleja davidii	Butterfly Bush	B	
Buxus microphylla japonica	Japanese Boxwood	A	10
Caesalpinia (Shrub Forms)	Bird of Paradise Bush	A	10
Camellia species	Camellia	A	10
Calliandra californica/eriophylla	Baja Fairy Duster	B	
Callistemon citrinus	Lemon Bottlebrush	B	
C. viminalis "Little John"	NCN	A	10
Calycanthus occidentalis	Western Spice Bush	B	
Carissa macrocarpa and Cultivars	Natal Plum	A	10
Carpenteria californica	Bush Anemone	A	10
Cassia artemisioides	Feathery Cassia	A	30
Ceanothus species	Wild Lilac	B	30
Cercocarpus betuiloides	Mountain Mahogany	B	30
Choisya ternata	Mexican orange	B	
Cistus species	Rockrose	B	
Comarostaphylis diversifolia	Summer Holly	B	
Convolvulus cneorum	Bush Morning Glory	B	
Coprosma pumila/repens	Mirror Plant	B	
Cotoneaster species & cultivars	Cotoneaster	B	
Crassula species	NCN	A	
Cuphea hyssopifolia	False Heather	A	
Cycas revoluta	Sago Palm	A	

Dasylirion quadrangulatum/wheeleri	Mexican Grass Tree	A	10
Dendromecon harfordii	Island Bush Poppy	B	
Dietes bicolor/irioides	Fortnight Lily	A	
Dodonaea viscosa (Purpurea)	Hopseed Bush	B	
Elaeagnus pungens & cultivars	Silverberry	B	
Encelia californica	Coast Sunflower	A	10
E. farinosa	Brittle Bush	B	
Erigonum giganteum	St. Catherine's Lace	B	
Escallonia species	Escallonia	A	10
Euonymus japonica & cultivars	Evergreen Euonymus	A	10
Euphorbia species		A	
Euryops pectinatus	NCN	A	
Fatsia japonica	Japanese Aralia	A	
Fouquieria splendens	Ocotillo	A	
Fremontodendron species & cultivars	Flannel Bush	B	
Gardenia jasminoides	Gardenia	A	
Garrya elliptica	Coast Silktassel	B	
Grevillea species & cultivars	Grevillea	B	
Grewia occidentalis	Lavender Starflower	B	
Hakea suaveolens	Sweet Hakea	B	
Hebe species & cultivars	Hebe	A	10
Hesperaloe parviflora	Red Yucca	A	
Hibiscus rosa - sinensis	Chinese Hibiscus	A	10
Ilex species	Holly	B	
Juniperus species	Juniper	B	
Justicia brandegeana	Shrimp Plant	A	10
J. californica	Chuparosa	B	
Keckiella cordifolia	Heart-Leaved Penstemon	B	
Kniphofia uvaria	Red-Hot Poker	A	
Lantana Camara & hybrids	Lantana	A	10
Larrea tridentata	Creosote Bush	B	
Lavandula species	Lavender	A	10
Lavatera assurgentiflora/maritima	California Tree Mallow	B	
Leonotis leonrus	Lion's Tail	B	
Leptospermum scoparium & varities	New Zealand Tea Tree	B	
Leucophyllum species		B	
Ligustrum japonicum	Wax-leaf Privet	A	10
Lupinus species	Lupine	B	
Mahonia aquifolium ('Compacta')	Oregon Grape	A	10
M. fremontii	Desert Mahonia	B	
M. 'Golden Abundance'	NCN	B	
M. lomariifolia	Venetian Blind Mahonia	A	
Malosma - See Rhus			
Malva species	Mallow	A	10
Melaleuca nesophila	Pink Melaleuca	A	10
Mimulus species (Diplacus)	Monkey Flower	A	10
Myrica californica	*Pacific Wax Myrtle*	*B*	

Myrsine africana	*African Boxwood*	*A*	*10*
Myrtus communis 'Compacta'	Dwarf Myrtle	A	10
Nandina domestica (including dwarf varieties)	Heavenly Bamboo	A	
Nerium oleander	Oleander	B	
N.o. 'Petite Salmon'	NCN	A	10
Opuntia species	Prickly Pear, Cholla etc.	A	
Phlomis fruticosa	Jerusalem Sage	A	
Phoenix roebelenii	Pygmy Date Palm	A	
Phormium tenax and Cultivars	New Zealand Flax	A	
Photinia fraseri	Photinia	B	
Pittosporum tobira ('Variegata')	Tobira	B	
P.t.'Wheeler's Dwarf'	Dwarf Pittosporum	A	
Punica granatum 'Nana'	Dwarf Pomegranate	A	10
Prunus ilicifolia	Hollyleaf Cherry	B	
Pyracantha species	Firethorn	B	
Rhamnus california/crocea	Coffeeberry	B	
Rhaphiolepis indica and Cultivars	India Hawthorn	A	10
Rhus integrifolia/laurina	Lemonade Berry	B	40
R. ovata	Sugar Bush	B	30
Ribes species	Currant/Gooseberry	A	10
Romneya coulteri	Matilija Poppy	B	
Rosa species (except R. californica)	Rose	A	
Rosmarinus officinalis & cultivars	Rosemary	B	
Salvia species - native varieties	Sage	B	
S. greggii/leucantha	Autumn Sage	A	10
Santolina chamaecyparissus/rosmarinifolius	Lavender Cotton	A	10
Simmondsia chinensis	Jojoba	B	
Strelitzia nicolai/regina	Bird of Paradise	A	
Tagetes lemmonii	Copper Canyon Daisy	B	
Tibouchina urvilleana	Princess Flower	A	10
Trichostema lanatum	Wooly Blue Curls	B	
Viburnum species	Viburnum	A	10
Westringia fruticosa	Coast Rosemary	A	10
Xylosma congestum	Shiny Xylosma	B	
X.c. 'Compacta'	Compact Xylosma	A	10
Yucca species	Yucca	B	
Trees			
Acacia farnesiana	Sweet Acacia	A	15
A. greggii	Catclaw Acacia	B	
A. salicina	Willow Acacia	A	15
A. smallii	NCN	A	15
A. stenophylla	Shoestring Acacia	A	15
Acer negundo	Box Elder	B	
A. palmatum	Japanese Maple	A	
A. saccharinum	Silver Maple	B	30

Aesculus californica	California Buckeye	B	
Agonis flexuosa	Peppermint Tree	B	
Albizia julibrissin	Silk Tree	B	
Alnus rhombifolia	Alder	B	
Arbutus unedo ('Marina')	Strawberry Tree	A	15
Archontophoenix cunninghamiana	King Palm	A	
Bauhinia variegata	Purple Orchid Tree	B	
Betula pendula	European White Birch	A	10
Brachychiton acerifolius/populneus	Flame Tree/Bottle Tree	B	
Brahea armata/edulis	Blue Hesper Palm	A	10
Butia capitata	Pindo Palm	A	10
Callistemon citrinus	Lemon Bottlebrush	B	
C. viminalis	Weeping Bottlebrush	A	15
Calocedrus decurrens	Incense Cedar	B	
Calodendrum capense	Cape Chestnut	B	
Cedrus deodara	Deodar Cedar	B	30
Ceratonia siliqua	Carob	B	30
Cercidium floridum/microphyllum	Blue Palo Verde	A	
Cercis occidentalis/canadensis	Western Redbud	A	10
Chamaerops humilis	Mediterranean Fan Palm	A	10
Chilopsis linearis	Desert Willow	A	15
Chionanthus retusus	Chinese Fringe Tree	A	10
Chitalpa X tashkentensis	Chitalpa	A	10
Chorisia speciosa	Floss Silk Tree	B	
Cinnamomum camphora	Camphor Tree	B	30
Citrus species	Citrus	A	10
Cocculus laurifolius	Laurel Leaf Snail Seed	B	
Cordyline australis	Giant Dracaena	A	
Cyathea cooperi	Australian Tree Fern	A	
Dicksonia antarctica	Tazmanian Tree Fern	A	
Dracaena draco	Dragon Tree	A	
Eriobotrya deflexa/japonica	Bronze Loquat/Loquat	A	10
Erythrina species	Coral Tree	B	
Feijoa sellowiana	Pineapple Guava	A	10
Ficus species	Fig	B	50
Fraxinus species	Ash	B	30
Geijera parviflora	Australian Willow	A	15
Ginkgo biloba	Maidenhair Tree	A	15
Gleditsia triacanthos	Honey Locust	A	15
Grevillea robusta	Silk Oak	B	
Heteromeles arbutifolia	Toyon	A	15
Hymenosporum flavum	Sweetshade Tree	A	15
Jacaranda mimosifolia	Jacaranda	B	
Juglans californica	Black Walnut	B	
Koelreuteria bipinnata/paniculata	Chinese Flame Tree	B	
Lagerstroemia indica	Crape Myrtle	A	10
Laurus nobilis	Sweet Bay	B	

Leptospermum laevigatum	Australian Tea Tree	A	15
Liquidambar formosana	Chinese Sweet Gum	A	15
L. styraciflua	American Sweet Gum	B	
Liriodendron tulipfera	Tulip Tree	B	
Lithocarpus densiflorus	Tanbark Oak	B	
Lophpstemon confertus (Tristania)	Brisbane Box	A	15
Lyonothamnus floribundus	Catalina Ironwood	A	15
Magnolia grandiflora	Southern Magnolia	B	
M. X soulangeana	Saucer Magnolia	A	10
Maytenus boaria	Mayten Tree	A	10
Melaleuca quinquenervia	Cajeput Tree	A	15
Metasequoia glypstroboides	Dawn Redwood	A	15
Metrosideros excelsus	New Zealand Christmas Tree	A	10
Morus alba	White Mulberry	B	
Olea europea	Olive - Fruitless only	A	15
Parkinsonia aculeata	Jerusalem Thorn	A	10
Phoenix dactylifera	Date Palm	B	
Pinus species	Pine	B	75
Pistacia chinensis	Chinese Pistache	B	
Pittosporum phillyraeoides	Willow Pittosporum	A	10
P. rhombifolium	Queensland Pittosporum	B	
Platanus racemosa	California Sycamore	B	
Podocarpus gracilior/macrophyllus	Fern Pine/Yew Pine	B	
Populus fremontii	Fremont Cottonwood	B	
Prosopis chilensis	Chilean Mesquite	B	
P. glandulosa	Honey Mesquite	A	15
Prunus cerasifera 'Atropurpurea'	Purple-leaf Plum	A	10
Punica granatum	Pomegranate	B	
Pyrus calleryana/kawakamii	Ornamental Pear	A	15
Quercus species	Oak	B	30
Rhus lancea	African Sumac	B	
Robinia ambigua	Locust	B	
Sapium sebiferum	Chinese Tallow Tree	B	
Schefflera actinophylla	Queensland Unbrella Tree	A	
Sophora japonica	Japanese Pagoda Tree	B	
Stenocarpus sinuatus	Firewheel Tree	A	10
Syagrus romanzoffianum	Queen Palm	A	
Tabebuia species	Trumpet Tree	A	15
Tipuana tipu	Tipu Tree	B	
Tupidanthus calyptratus	Tupidanthus	A	
Trachycarpus fortunei	Windmill Palm	A	
Umbellularia californica	California Bay	B	
Washingtonia filifera	California Fan Palm	B	30
Zelkova serrata	Sawleaf Zelkova	B	

Source: Los Angeles County Fire Department, Fuel Modification Unit.

Notes:

1. The plant list above is intended to be a representative sample of which plants are appropriate in Zones A or B considering their size, moisture content, leaf litter production, and chemical

composition.

2. Plants with certain physical and chemical characteristics make them more flammable and should not be planted close to structures in fire hazard areas. These trees should be spaced to allow a minimum canopy clearance at maturity from the structure as specified in the above table.
3. Landscape Designers may choose plants that are not on this list and may be acceptable if their plant characteristics are fuel modification zone appropriate.
4. Additionally, selecting regionally appropriate plants and the consideration of climate and microclimate adaptability is the responsibility of the Landscape Designer.

Appendix D-2

LACoFD Undesirable Plant List

Botanical Name	Common Name	Comment*
Adenostoma fasciculatum	Chamise	F
Adenostoma sparsifolium	Red Shank	F
Artemesia californica	California Sagebrush	F
Carpobrotus edulis	Hottentot-fig	F, I
Cortaderia spp.	Pampas Grass	F, I
Cupressus spp.	Cypress	F
Eriogonum fasciculatum	Common Buckwheat	F
Eucalyptus spp.	Eucalyptus	F
Jasminum humile	Italian Jasmine	F
Plumbago auriculata	Cape Plumbago	F
Tecoma capensis	Cape Honeysuckle	F

*F = flammable, I = Invasive

Notes:

1. Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be either physical or chemical. Physical properties would include large amounts of dead material retained within the plant, rough or peeling bark, and the production of copious amounts of litter. Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch. Plants with these characteristics should not be planted close to structures in fire hazard areas. These species are typically referred to as "Target Species" since their complete or partial removal from the landscape is a critical part of hazard reduction. Therefore, any plant listed in the above table is not allowed as part of an acceptable Fuel Modification Plan.
2. Plants on this list that are considered invasive are a partial list of commonly found plants. There are many other plants considered invasive that should not be planted in a fuel modification zone and they can be found on The California Invasive Plant Council's Website www.cal-ipc.org/ip/inventory/index.php. Other plants not considered invasive at this time may be determined to be invasive after further study.
3. For the purpose of using this list as a guide in selecting plant material, it is stipulated that all plant material will burn under various conditions.
4. The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is fire resistive.
5. All vegetation used in Fuel Modification Zones and elsewhere within the Chadwick Ranch Estates Project site shall be subject to approval of the L.A. County Fire Department's Fuel Modification Unit or Fire Code official.